NOTICE

All drawings located at the end of the document.

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FINAL

ACCELERATED RESPONSE ACTION COMPLETION REPORT

HOT SPOT REMOVAL

Rocky Flats Environmental Technology Site
(Operable Unit No. 1)

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden, Colorado

APRIL 1995

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LIST OF ACRONYMS

AEA	Atomic Energy Act
ARA	Accelerated Response Action
ARAR	applicable or relevant and appropriate requirement
BEHP	bis(2-ethylhexyl)phthalate
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
cpm	counts per minute
DOE	Department of Energy
FIDLER	Field Instrument for the Detection of Low Energy Radiation
ft^2	square feet
HPGe	High Purity Germanium
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measures/Interim Remedial Action
LDR	Land Disposal Restrictions
nCi/g	nanoCuries per gram
OU1	Operable Unit No. 1
PAH	polynuclear aromatic hydrocarbon
PAM	Proposed Action Memorandum
PCE	tetrachloroethene
pCi/g	picoCuries per gram
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOX	total organic halogens
TSCA	Toxic Substance Control Act
VOC	volatile organic compound
WAC	waste acceptance criteria
μg/kg	microgram per kilogram

EXECUTIVE SUMMARY

The U.S. Department of Energy has conducted an Accelerated Response Action consisting of the removal of radionuclide-contaminated soils ("hot spots") at six specific locations within Operable Unit No. 1 at the Rocky Flats Environmental Technology Site (RFETS) located in Golden, Colorado. The hot spots were localized shallow contaminated soils that contained substantial activities of either plutonium/americium or uranium, as well as traces of several organic compounds. The Accelerated Response Action included excavating, containerizing, storing and disposing of the contaminated soils from the hot spots. This Completion Report documents the activities and results of the Accelerated Response Action.

The activity levels of plutonium-239,240 and americium-241 at the hot spots posed an unacceptable current health risk to workers and future health risk to the public. These carcinogenic risks exceeded the Environmental Protection Agency's acceptable risk of 10^{-4}. Although the activities of the uranium isotopes did not pose an unacceptable risk, the hot spots were subject to erosion and, therefore, were removed to also mitigate migration of uranium (and plutonium/americium) into the local watershed (Woman Creek).

Twenty-one 55-gallon drums of radionuclide-contaminated soil were removed from Operable Unit No. 1. The soils were temporarily stored at RFETS, and then transported and disposed at the Envirocare facility in Utah which is permitted to accept mixed low-level wastes. Residual plutonium-239,240 and americium-241 activities in the soils are 0.1 to 0.2% of the maximum activities measured at the hot spot posing the greatest risk to workers and the public. This has reduced potential risks by orders of magnitude such that the currents risk estimates are well below 10^{-4}. The uranium activities at the hot spots have been reduced by 4 to 500 times their original maximum activity levels.

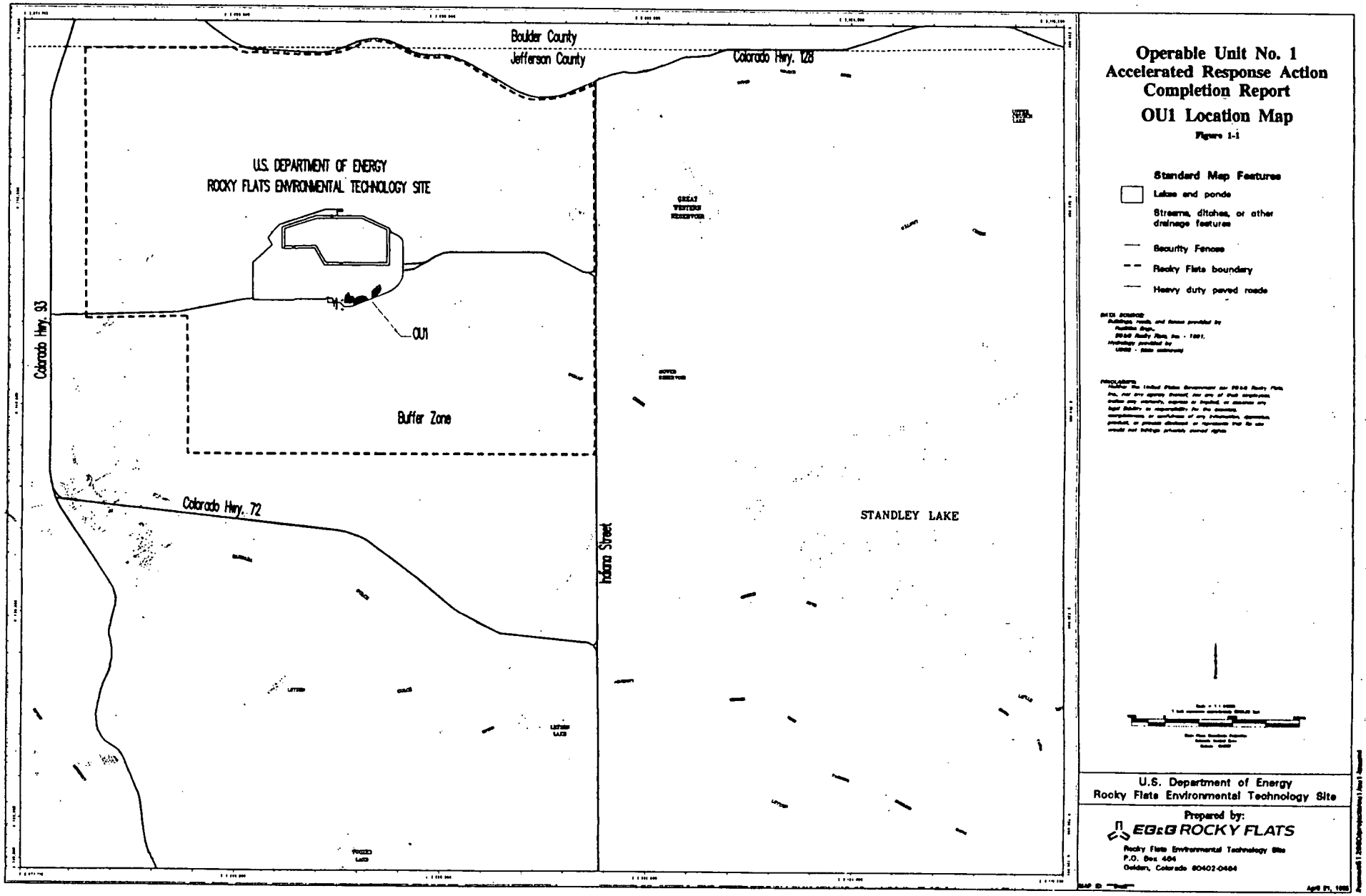
1.0 INTRODUCTION

This Completion Report documents the activities and results of the U.S. Department of Energy's (DOE's) Accelerated Response Action (ARA) to remove radionuclide-contaminated soils ("hot spots") at six specific locations within the Individual Hazardous Substance Site (IHSS) 119.1 and near IHSS 119.2 at the Rocky Flats Environmental Technology Site (RFETS) located in Golden, Colorado. These IHSSs are located within Operable Unit No. 1 (OU1) (Figures 1-1 and 1-2). The hot spots were localized shallow contaminated soils that contained substantial activities of either plutonium/americium or uranium, as well as traces of several organic compounds. The ARA included excavating, containerizing, storing, and disposing of the contaminated soils from these hot spots.

An ARA, as defined in the amendment to the current Inter-Agency Agreement (IAG), is a remedial response action that all parties (DOE, Environmental Protection Agency, Region VIII [EPA], and Colorado Department of Public Health and Environment [CDPHE]) agree is necessary and appropriate to provide for expeditious mitigation of a threat or potential threat to public health or environment, and can be implemented within 6 months. A Proposed Action Memorandum (PAM) (DOE, 1994a) was prepared by the DOE and approved by the EPA and CDPHE prior to conduct of this ARA. The PAM is the decision document that substantiates the need for the action and the selected cleanup method.

1.1 RFETS BACKGROUND

RFETS is a government-owned, contractor-operated facility that is part of the nationwide nuclear weapons production complex. Until January 1992, RFETS was operated as a nuclear weapons research, development, and production complex. RFETS fabricated nuclear weapons components from plutonium, uranium, beryllium, and stainless steel. Support activities included chemical recovery, purification of recyclable transuranic radionuclides, and research and development of metallurgy, machining, nondestructive testing, coatings, remote engineering, chemistry, and physics. The RFETS is currently a Resource Conservation and Recovery Act (RCRA) hazardous waste treatment/storage facility. RFETS is in transition from a defense production facility to a facility that will be used for such future missions as environmental


Boulder County
Jefferson County
Colorado Hwy. 128
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU1
Buffer Zone
Colorado Hwy. 93
Colorado Hwy. 72
Indiana Street
STANDLEY LAKE
GREAT WESTERN RESERVOIR
Operable Unit No. 1
Accelerated Response Action
Completion Report
OU1 Location Map
Figure 1-1
Standard Map Features
Lakes and ponds
Streams, ditches, or other drainage features
Security Fences
Rocky Flats boundary
Heavy duty paved roads
U.S. Department of Energy
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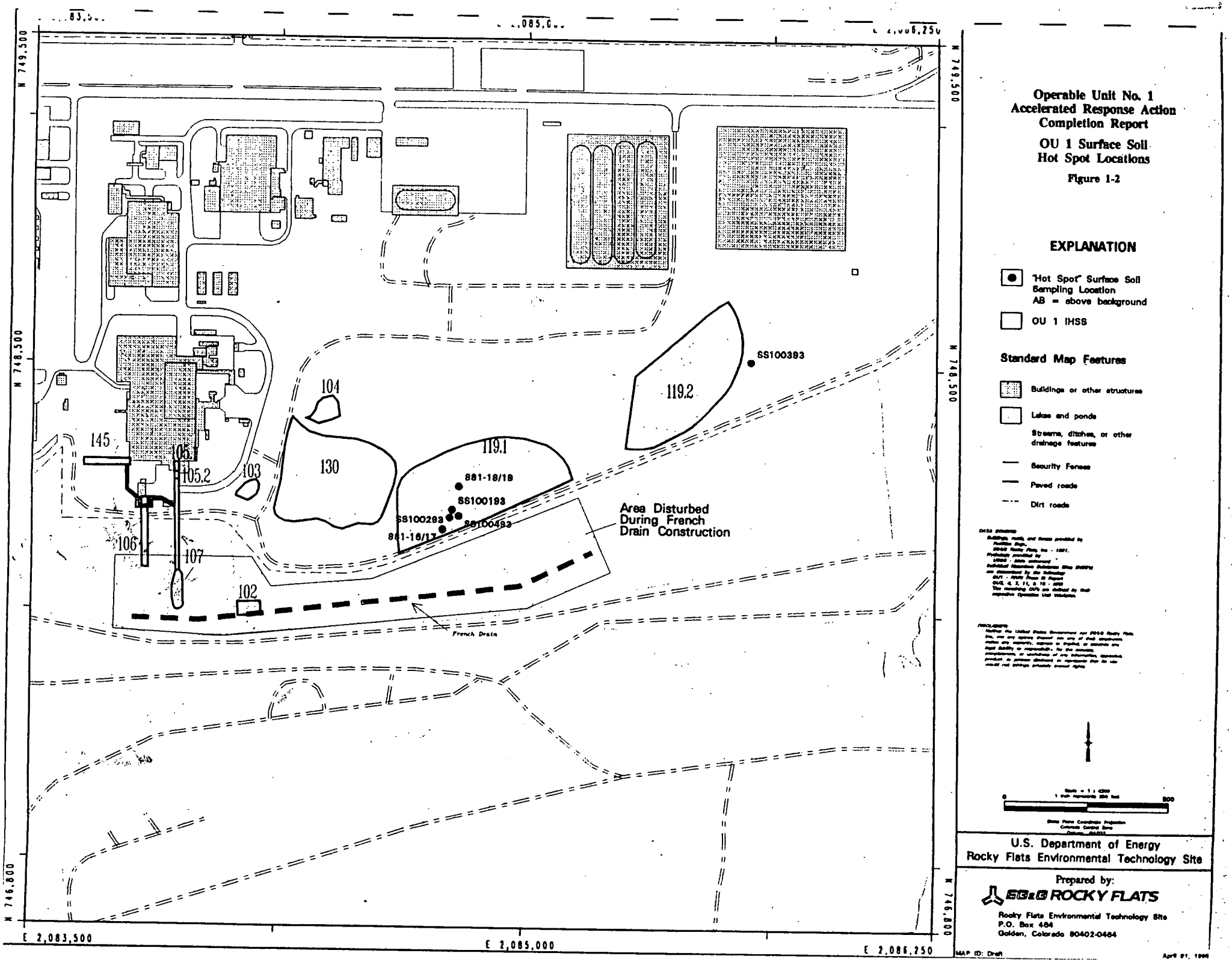

Operable Unit No. 1
Accelerated Response Action
Completion Report

OU 1 Surface Soil
Hot Spot Locations

Figure 1-2

EXPLANATION

- "Hot Spot" Surface Soil Sampling Location
  AB = above background
- OU 1 IHSS

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Security Fences
- Paved roads
- Dirt roads

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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MAP ID: Draft

April 01, 1996

restoration, waste management, maintaining production contingency, and eventually decontamination and decommissioning.

The IAG, signed by the DOE, the EPA, and the CDPHE in 1991, grouped RFETS-contaminated areas into 16 OUs. The IAG requires the investigation, study, and remediation of OU1 as well as the other OUs at RFETS.

1.2 SITE DESCRIPTION

IHSSs 119.1 and 119.2 at OU1 have historically (1968–1971) been used for temporary storage of drums of wastes containing radionuclides, solvents, and oils. A combined RCRA Facility Investigation (RFI)/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation (RI) was conducted in three phases to evaluate the nature and extent of contamination resulting from releases of hazardous substances at IHSSs 119.1/119.2 and other IHSSs at OU1. The Phase III Final RFI/RI Report was submitted to EPA and CDPHE in June 1994 (DOE, 1994b). The RFI/RI confirmed that soil and groundwater are contaminated with solvents, and that shallow soils are also contaminated with radionuclides. The soil and groundwater contamination at IHSS 119.1 described in the Phase III RFI/RI report was consistent with that found in leaks from drums containing radionuclide-contaminated lathe coolant or other process wastes generated by historical operations at RFETS. The contaminated groundwater is being addressed by an Interim Measures/Interim Remedial Action (IM/IRA) involving groundwater withdrawal via an extraction well and french drain, with subsequent groundwater treatment.

A detailed radiological survey identified the hot spots, which are discrete areas of soil contaminated with either uranium or plutonium, and americium (Section 2.1.1). These areas are identified in the RFI/RI report as locations SS100193, SS100293, SS100393, SS100493, 881-16/17, and 881-18/19. Five of these contaminated areas are clustered within a small area in IHSS 119.1. The sixth contaminated area is located near IHSS 119.2 (Figure 1-2).

2.0 PRE-ARA SITE CONDITIONS

2.1 HOT SPOT INVESTIGATION

A hot spot was discovered unexpectedly during a pre-job survey for the maintenance of the IM/IRA extraction well within IHSS 119.1. The hot spot dimensions were preliminarily determined to be roughly 10 inches in diameter by 12 inches deep, with activities ranging from 10 nanoCuries per gram (nCi/g) (surface) to 50 picoCuries per gram (pCi/g) (at 1 foot).

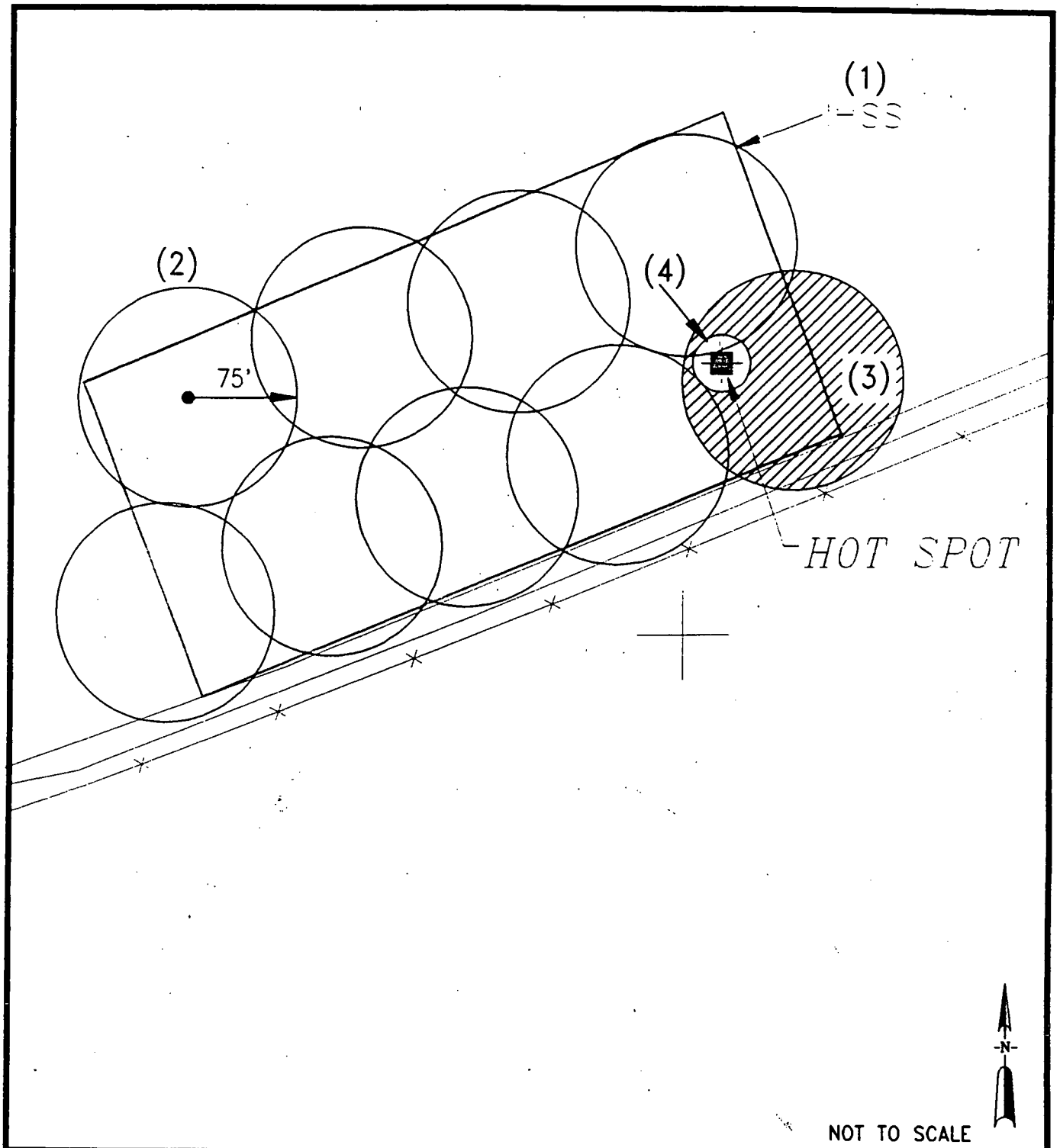
EG&G conducted an additional investigation to evaluate the existence of other hot spots at OU1. Figure 2-1 depicts the conceptual design of the investigation and Table 2-1 summarizes the actual events. This investigation consisted of:

1) Surveying IHSSs 119.1, 119.2, and 130 with a truck-mounted High Purity Germanium (HPGe) Detector. Each survey measurement covered a 75-foot radius (150-foot diameter), providing approximately 90% to 100% detection coverage. The HPGe survey identified nine anomalous areas with an integrated point source activity greater that 100 microcuries of americium-241.

2) Conducting a walk-over survey of the nine anomalous areas using a Field Instrument for the Detection of Low Energy Radiation (FIDLER). The FIDLER survey identified four localized areas with elevated activities (hot spots), i.e., soils with activities at or greater than the local background, which was defined as the mean FIDLER reading plus two standard deviations.

3) Conducting soil sampling and analysis of identified hot spots. Surface soil samples were collected using the CDPHE protocol that specifies the collection of surface scrapes to a depth of 1/4-inch below ground surface. Samples were then collected at depth using a hand auger until auger refusal.

The radiological surveys described above failed to detect the presence of two uranium hot spots previously identified in a surface soil radiological characterization study conducted in 1987. The sample identification numbers for these hot spots are 881-16/17 and 881-18/19. During July and August 1994, an additional soil radiological survey was performed using the FIDLER and HPGe to verify the existence of these hot spots, and provide baseline HPGe data for the four other hot spots (Table 2-2). Hot spots 881-16/17 and 881-18/19 were located, staked, and surveyed. Their locations are also shown on Figure 1-2. The HPGe activity per unit mass data presented



CHARACTERIZATION APPROACH:

1) Identify IHSS with Potential Surface Radionuclide Contamination
2) Use HPGe Survey to get 100% Coverage of IHSS and Identify Potential "Hot Spots".
3) Conduct Walk-over Survey with FIDLER to Locate "Hot Spot".
4) Sample "Hot Spot" Locations Identified in Step 3.

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden, Colorado

OPERABLE UNIT NO. 1
ACCELERATED RESPONSE ACTION
COMPLETION REPORT

Conceptual Depiction of the OU1 Surficial Soil Radiological Characterization Plan

Figure 2-1

R77003.MBP/1-041295/100

Table 2-1

Hot Spot Investigation History

Event	Date
Original hot spot identified	August 1992
HPGe Survey (identifies nine areas in IHSSs 119.1, 119.2, and 130)	December 1992 to January 1993
Sampling of original hot spot	January 1993
FIDLER Survey (identifies four hot spots)	March to April 1993
Hot spot sampling	April 1993
Receipt of validated data	September 1993
Draft RFI/RI Report presenting hot spot findings	February 1994
Final RFI/RI Report	June 1994
Confirmation radiological survey	July and August 1994

Table 2-2

Radionuclides Activities in OU1 Hot Spot Soils

Sample Location	Depth	FIDLER Reading[a] (CPM)	Americium-241		Plutonium -239,240		Uranium -233,234		Uranium -235		Uranium -238	
			Laboratory Measured Activity[a] (pCi/g)	HPGe Measured Activity[b] (pCi/g)	Laboratory Measured Activity[a] (pCi/g)	HPGe Measured Activity[b] (pCi/g)	Laboratory Measured Activity[a] (pCi/g)	HPGe Measured Activity[b] (pCi/g)	Laboratory Measured Activity[a] (pCi/g)	HPGe Measured Activity[b] (pCi/g)	Laboratory Measured Activity[a] (pCi/g)	HPGe Measured Activity[b] (pCi/g)
Background[c]	0.0 to 0.25"	NA	0.04	NA	0.10	NA	1.6	NA	0.12	NA	2.0	NA
SS100193		8193		0		NA		NA		0.83		9.74
	0.0 to 0.25"		0.0294		0.0735		6.09		0.176		3.38	
	0.0 to 1.4'		0.0493		0.133		429		14.6	4.1	122	
SS100293		3667		0.24		NA		NA		0.44		2.99
	0.0 to 0.25"		0.153		0.429		25.4		0.843		1.39	
	0.0 to 2.0'		0.192		0.878		240		6.23		1.51	
	0.0 to 3.7'		0.0372		0.0539		8.27		0.301		0.779	
SS100393		3494		2.19		NA		NA		0.04		1.27
	0.0 to 0.25"		4.15		22.7		1.49		0.107		0.892	
	0.0 to 1.0'		1.9		14.7		0.64		0.0557		0.75	
SS100493		202920		47.6		NA		NA		0.10		1.72
	0.75"		2650		11100		9.68		0		4.69	
	4.0 to 5.0"		4260		17100		7.46		0.92		8.22	
	9.0 to 10.0"		2010		6570		0.91		2.07		1.22	
881-16/17				NA		NA		NA		0.26		12.6
	0.0 to 0.25"		NA		0.3		50		0		1,300	
881-18/19				NA		NA		NA		0.32		19.4
	0.0 to 0.25"		NA		0.42		60		12		3,000	

[a] From DOE, 1994b.
[b] SS100193, SS100293, SS100393, SS100493 measurements taken with truck-mounted HPG on 7/21/94. 881-16/17 and 881-18/19 measurements taken on 8/16/94 and 7/26/94, respectively, using a tripod-mounted HPGe. Uranium-233,234 was not analyzed because the gamma energies are too low for detection.
[c] Represents the upper limit of a 95% tolerance interval (95% confidence, 95% of population) for background surface soil activities. From DOE, 1994b.
NA = Not analyzed

in Table 2-2 is calculated from the total activity assuming the activity is dispersed over the area scanned, an effective gamma ray emittance depth of 3 centimeters (cm), and an *in situ* soil density of 1 gm/cm^3.

2.2 HOT SPOT SOIL SAMPLING RESULTS

2.2.1 Radionuclides

As indicated in Table 2-2, hot spots were generally found to be markedly contaminated with either plutonium/americium or uranium. Plutonium, at activities greater than 10,000 pCi/g, was found in soil samples from hot spot SS100493, which is three to four orders of magnitude greater than the activity of any other surface soil samples at OU1 (Figure 2-2), and five orders of magnitude greater than background (0.1 pCi/g) (refer to Table 2-2 for background radionuclide activities). The distribution of americium parallels that of plutonium as this radionuclide is an "in growth" daughter of plutonium decay. The highest americium activity (4,260 pCi/g) was also detected in a sample from SS100493, which is also five orders of magnitude greater than background (0.04 pCi/g), and greater than the activity in any other surface soil sample at OU1 (Figure 2-3). Uranium activities were significantly above background at SS100193, SS100293, 881-16/17, and 881-18/19. The maximum total uranium activities at SS100193, SS100293, 881-16/17, and 881-18/19 were 566 pCi/g, 248 pCi/g, 1,350 pCi/g, and 3,060 pCi/g, respectively. These activities exceed those in surface soils at OU1 by two to three orders of magnitude. Surface soils at OU1 are generally at background levels (1.6 pCi/g and 2.0 pCi/g for uranium-233,234 and uranium-238, respectively) (Figures 2-4 and 2-5).

The uranium-234/uranium-238 ratio is an indicator of the form of uranium present, i.e., natural, depleted, or enriched. Uranium-233,234/uranium-238 is used to estimate this ratio (the analytical method does not differentiate uranium-233 from uranium-234). The estimate is close to the actual uranium-234/uranium-238 ratio because the activity of uranium-233 in natural uranium is zero and occurs only in trace amounts in depleted and enriched uranium. Unlike natural uranium, which has a uranium-234/uranium-238 activity ratio of approximately 1, the depleted uranium isotopic ratio is 0.07, and the enriched uranium isotopic ratio is 5.7. The uranium-233,234/uranium-238 ratios at SS100193 and 881-16/17 (and 881-18/19) suggest the

presence of enriched uranium and depleted uranium, respectively (Table 2-3). The uranium isotopic ratio at SS100293 greatly exceeds 5.7, suggesting a significant activity of uranium-233. All these forms of uranium were used at RFETS.

2.2.2 Organic Contaminants

Samples from hot spots SS100193, SS100293, and SS100393 were analyzed for EPA Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and pesticides/polychlorinated biphenyls (PCBs). Samples from SS100493 were analyzed only for VOCs. Detected compounds and their concentrations are shown in Table 2-4. Samples were not collected for organic compound analysis from hot spots 881-16/17 and 881-18/19.

PCBs (Aroclor-1254) were detected in a sample from SS100393 at a concentration of 460 micrograms per kilogram (μg/kg). The PCB concentration was similar to those found in samples from nearby surface soil sampling stations (range 132.5 to 1,200 μg/kg) (DOE, 1994b).

Polynuclear aromatic hydrocarbons (PAHs) were detected in the samples collected from hot spots SS100193, SS100293, and SS100393 (Table 2-4). Concentrations were similar to the results of the OU1-wide surface soil sampling results. PAHs are ubiquitous in surface soils in urban areas, and the elevated concentrations do not appear to be associated with waste-related activities at the IHSSs.

Toluene was present in samples collected from each of the four hot spot locations, and tetrachloroethene (PCE) was present in the sample collected from location SS100493, located in IHSS 119.1 (Table 2-3). For both compounds, concentrations are highest in subsurface soils as would be expected due to enhanced volatilization near the surface from solar heating of the soils.

Table 2-3

Characterization of Uranium Hot Spots

Hot Spot	U-233,234/U-238 Ratio*	Type of Uranium	Comment
SS100193	3.5	Enriched	Enriched uranium has a U-234/U-238 ratio of 5.7.
SS100293	159	U-233	Isotopic ratio greatly exceeds that of enriched uranium indicating significant presence of U-233.
SS100393	1.7	Natural	Natural uranium has a U-234/U-238 ratio of 1.0.
SS100493	0.9	Natural	See above.
881-16/17	0.04	Depleted	Depleted uranium has a U-234/U-238 ratio of 0.07.
881-18/19	0.02	Depleted	See above.

* Calculated from sample with greatest uranium activity.

Table 2-4

Organic Compounds Detected in Hot Spot Samples

Sample Location	Sample Depth (feet)	Concentrations (μg/kg)			
		Toluene	PCE	Total PAHs	PCB
SS100193	0 - 0.25	ND	ND	3174	ND
	0 - 1.4	NA	NA	3219	ND
	1.4 - 1.7	100	1J	NA	NA
SS100293	0 - 0.25	23	ND	2907	ND
	0 - 2.0	NA	NA	NA	ND
	2.0 - 2.3	54	ND	NA	NA
	2.0 - 3.7	NA	NA	ND	ND
	3.7 - 4.0	69	ND	NA	NA
SS100393	0 - 0.25	13	ND	4602	ND
	0 - 1.0	NA	NA	3179	460*
	1.0 - 1.3	85	ND	NA	NA
SS100493	0 - 0.25	3J	6	NA	NA
	2.0 - 2.3	120	170	NA	NA
	3.3 - 3.6	28	15	NA	NA

* Aroclor 1254
NA = Not analyzed
ND = Not detected
J = estimated value below detection limit.
μg/kg = micrograms per kilogram.

Note: Only pre-ARA radiological data exist for hot spots 881-16/17 and 881-18/19.

2.3 ARA RATIONALE

The ARA was undertaken because the site conditions that trigger a CERCLA removal action [40 CFR 300.415(b)(2)] were observed, and the response action could be conducted within 6 months per the proposed language to modify the IAG. Based upon the review of the potential for exposure to and migration of chemicals present in the surface and shallow subsurface soils at the hot spots locations, the conditions specified at 40 CFR 300.415(b)(2)(i, iv, and v) were met, i.e., actual or potential exposure to human populations, high levels of hazardous substances largely at or near the surface, and weather conditions that may cause hazardous substances to migrate.

There were current health risks to workers and future health risks to the public posed by the radionuclides (plutonium and americium) in the hot spot soils (DOE, 1994b). The dominant pathways for exposure to the radionuclides were incidental ingestion of soils and inhalation of dust. As shown in Table 2-4, the estimated carcinogenic risk for a current on-site worker (security specialist) was 1.1×10^{-4}. This risk just exceeded EPA's 10^{-6} to 10^{-4} range for acceptable exposure [40 CFR 300.430(e)(2)(i)(A)(2)]. The risk to an on-site future resident was 2.7×10^{-2} if the hot spots were present, and only 9.8×10^{-6} if the hot spots were removed. Although the risk estimation was conservative because the hot spot radionuclide activities were averaged with the other surface soil data without consideration for area weighting, it was clear that the presence of the hot spots posed unacceptable health risks.

The uranium activities in surface soils at OU1, considering the presence of the hot spots, did not pose unacceptable public health risks. However, the hot spot soils were subject to erosion and subsequent migration of radioactive contaminants into the Woman Creek drainage. Therefore, the uranium hot spots were also removed to reduce the potential for migration and spreading of contamination through runoff.

Table 2-5

Estimated Carcinogenic Risk from Exposure to Plutonium and Americium in OU1 Soils

Exposure Scenario	Exposure Pathway	Carcinogenic Risk		
		Pu-239, 240	Am-241	Total
Current On-Site Worker (w/hot spots present)	Ingestion of soil Inhalation of dust	3.6×10^{-6} 8.5×10^{-5}	1.1×10^{-6} 2×10^{-5}	4.7×10^{-6} 1.05×10^{-4}
			Total Risk	1.1×10^{-4}
Future On-Site Resident (w/hot spots present)	Ingestion of soil Inhalation of dust	1.8×10^{-3} 2.1×10^{-2}	4.5×10^{-4} 4.3×10^{-3}	2.2×10^{-3} 2.5×10^{-2}
			Total Risk	2.7×10^{-2}
Future On-Site Resident (w/hot spots removed)	Ingestion of soil Inhalation of dust	6.6×10^{-7} 7.9×10^{-6}	1.2×10^{-7} 1.1×10^{-6}	7.8×10^{-7} 9.0×10^{-6}
			Total Risk	9.8×10^{-6}

3.0 ARA DESCRIPTION

3.1 HOT SPOT REMOVAL PROCESS

Excavation of the hot spots was guided by the use of the FIDLER, i.e., soils were removed until activities within the excavations were at local background levels. Prior to excavation of the soils, FIDLER measurements were taken at 10 randomly chosen locations within OU1 to establish local background (Figure 3-1). Although the PAM specified 10 measurements surrounding each hot spot, the former approach was used because of the close proximity of the hot spots. Per the PAM, local background gamma activity was established as the mean plus two standard deviations of the 10 FIDLER readings. This statistic represents an estimate of the upper 95th percentile of the background population. As shown in Table 3-1, the computed background value was 1,907 counts per minute (cpm).

The soils were excavated using hand tools and a backhoe. Excavation occurred in 6-inch lifts until all of the FIDLER readings were near or below the background value. After contaminated soil (based on FIDLER readings) had been excavated, an additional 6 inches of soil was removed and final FIDLER readings were taken (Table 3-1 and Figure 3-1). As can be seen, the FIDLER readings at the bottom and sides of the excavations were near or below this value and most often below the background value of 1,907 cpm. An HPGe radiological survey of each excavation was finally conducted using a tripod-mounted unit. All excavation field work was performed in 5 working days.

The hand tools and backhoe were decontaminated and surveyed before their use on the site. Hand tools were decontaminated at a temporary decontamination pad constructed at the site. Decontamination at this location consisted of a Liquinox wash followed by triple rinsing with deionized water. Sampling equipment was decontaminated at the temporary decontamination pad between confirmation sampling of each hot spot excavation and between each drum sampling for soil characterization. Excavation equipment was cleaned after removal of each hot spot by scraping off excess soil and then wiping down the equipment. The hand tools and backhoe were decontaminated at the contractor yard decontamination pad (RCRA Unit 18.01) after all

Table 3-1

Hot Spot Removal Operation FIDLER Readings (cpm)

Pre-ARA		Post-ARA											
Background		SS100193		SS100293		SS100393		SS100493		881-16/17		881-18/19	
Location[a]	Reading	Location[b]	Reading	Location[b]	Reading	Location[b]	Reading	Location[b]	Reading	Location[b]	Reading	Location[b]	Reading
1	1594	23	1542	43	1567	8	1459	1	1813	36	1533	16	1373
2	1790	24	1490	44	1678	9	1420	2	1996	37	1988	18	1606
3	1652	25	1847	45	2046	10	1424	3	1638	38	1646	20	1550
4	1728	26	2150	46	1927	11	1293	4	1884	39	1476	21	1354
5	1728	27	1486	47	1559			5	1837	40	2102	22	1320
6	1600	28	1770	48	1668			6	1797	41	2128		
7	1685							7	1846	42	2253		
8	1818							8	1831				
9	1756							9	2014				
10	1875							10	1521				
								11	1574				
$\bar{x}$ = 1723 s = 92 $\bar{x}$ + 2s = 1907													

[a] Readings taken 9/28/94; see Figure 3-1.
[b] Readings taken 10/4/94; see Figure 3-2.

excavation activity was completed. Decontamination at the pad consisted of steam cleaning (180°F at 2,500 psi).

As soil was excavated, it was placed directly into lined, steel drums. Soils from different hot spots were not mixed in a drum, i.e., each drum of soil is associated with a unique hot spot. The drums were transported to the temporary storage area (RFETS RCRA Storage Site 18.04) on a daily basis. The volume of contaminated soil excavated filled twenty-one 55-gallon drums; 14 drums of soil from SS100493, 3 drums from SS100293, and 1 drum each from SS100193, SS100393, 881-16/17, and 881-18/19. The approximate area of the excavation at SS100493 was 72 square feet (ft^2) (12 ft. x 6 ft.). The areas of the other hot spot excavations were all less than 16 ft^2 (refer to Appendix B). The excavated soil was sent to Envirocare in Utah for disposal as a mixed waste on March 28, 1995. DOE currently has a contract with Envirocare for the disposal of low-level mixed wastes generated at the RFETS.

3.2 CONFIRMATION AND WASTE CHARACTERIZATION SAMPLING AND ANALYSIS

Confirmation samples were collected once hot spot soil removal was completed. In accordance with the Sampling and Analysis Plan (SAP) (DOE, 1994c), four samples were collected from the bottom/sides of each hot spot excavation. Sample locations were randomly chosen by overlaying a grid on the excavation consisting of 36 grid segments, and using the role of a die to determine the random coordinates for each sample. The grid was established using string and small pegs. The soil samples were surface scrapes collected in accordance with procedure GT.08, "Surface Soil Sampling" (DOE, 1994c).

Soil samples were collected from the drums for subsequent analysis to characterize the soils for proper treatment/disposal. For SS100493, the first three drums of soil and every other drum thereafter were sampled. All drums of soils from the other hot spots were sampled (Table 3-2). Soil samples collected for VOC analysis were grab samples taken from the middle or bottom of the drum using an auger. All other samples were composites collected with an auger in accordance with the SAP. Five 2-pound (1 kilogram) samples of the drummed soils were also

TABLE 3-2
Confirmation and Waste Characterization
Sampling and Analysis Program

LOCATION	SAMPLE#	Preservatives	VOCs	SVOCs	Metals	PCB/Herb/Pest	Reactivity	Soil pH	TCLP Metal	TCLP Organics	TCLP PCB/Pest/Herb	TOX Analysis	Pu-238,-239/240	Am-241	U-233/234,-235,-238	Gross Alpha, Beta	Rad Screen	Sample Type	Drum#/Grid Location	Associated Drum#	Drum Fill Order *	Comments
SS100193	SS00341EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	3,4	N/A		
SS100193	SS00342EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	2,5	N/A		
SS100193	SS00343EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	3,3	N/A		
SS100193	SS00344EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	3,6	N/A		
SS100293	SS00345EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	4,5	N/A		
SS100293	SS00346EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	4,3	N/A		
SS100293	SS00347EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	6,2	N/A		
SS100293	SS00348EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	2,5	N/A		
SS100393	SS00349EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	5,5	N/A		
SS100393	SS00350EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	6,5	N/A		
SS100393	SS00351EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	5,3	N/A		
SS100393	SS00352EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	1,4	N/A		
SS100493	SS00353EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	4,5	N/A		
SS100493	SS00345EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	5,2	N/A		
SS100493	SS00355EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	3,4	N/A		
SS100493	SS00356EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	5,3	N/A		
SS100493	SS00357EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Dup.	4,5	N/A		
881-16/17	SS00358EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	1,6	N/A		
881-16/17	SS00359EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	4,1	N/A		
881-16/17	SS00360EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	5,3	N/A		
881-16/17	SS00361EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	2,4	N/A		
881-18/19	SS00362EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	4,5	N/A		
881-18/19	SS00363EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	3,2	N/A		
881-18/19	SS00364EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	1,3	N/A		
881-18/19	SS00365EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Conf.	6,1	N/A		
881-18/19	SS00366EG	N/A											G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Dup.	1,3	N/A		

TABLE 3-2 (Cont.)
Confirmation and Waste Characterization
Sampling and Analysis Program

LOCATION	SAMPLE#	Preservatives	VOCs	SVOCs	Metals	PCB/Herb/Pest	Reactivity	Soil pH	TCLP Metal	TCLP Organics	TCLP PCB/Pest/Herb	TOX Analysis	Pu-238,-239/240	Am-241	U-233/234,-235,-238	Gross Alpha, Beta	Rad Screen	Sample Type	Drum#/Grid Location	Associated Drum#	Drum Fill Order *	Comments
SS100293	SS00367EG	N/A											G/ITQ	G/ITQ	X/SCI	X/SCI	G/EG&G	Rins.	N/A	N/A		
881-18/19,SS100193,SS100293	SS00368EG	N/A											G/ITQ	G/ITQ	X/SCI	X/SCI	G/EG&G	Rins.	N/A	N/A		
SS100193	SS00369EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84854	N/A	20	
SS100293	SS00370EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84853	N/A	18	
SS100293	SS00371EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84852	N/A	17	
SS100293	SS00372EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84849	N/A	19	1/3 Full
Not Used	SS00373EG																G/EG&G					
SS100393	SS00374EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84409	N/A	21	1/2 Full
SS100493	SS00375EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84395	D84404	3(4)	
SS100493	SS00376EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84394	N/A	1	
SS100493	SS00377EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84397	D84093	5(6)	
SS100493	SS00378EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84398	N/A	2	
881-16/17	SS00379EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84850	N/A	16	
881-18/19	SS00380EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84405	N/A	15	
SS100293	SS00381EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Dup.	D84853	N/A	18	
Trip Blank	SS00382EG	HCl	X/ITSL														G/EG&G	TBlnk.				
Trip Blank	SS00383EG	HCl	X/ITSL														G/EG&G	TBlnk.				
SS100493	SS00384EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84403	D84396	7(8)	
SS100493	SS00385EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84402	D84408	9(10)	
SS100493	SS00386EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84399	D84401	11(12)	
SS100493	SS00387EG	N/A	G/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITSL	C/ITS	C/ITS	C/ITS	C/ITS	C/ITS	G/ITQ	G/ITQ	G/SCI	G/SCI	G/EG&G	Char.	D84406	D84407	13(14)	Top 12" **
Not Used	SS00388EG	N/A																				
Not Used	SS00389EG	N/A																				
Not Used	SS00390EG	N/A																				
G - Grab Sample																						
C - Composite Sample																						
ITSL - IT St. Louis Laboratory																						
ITQ - IT Quanterra Laboratory																						
SCI - Scientech Laboratory																						
EG&G - EG&G Rocky Flats Inc. On-Site Laboratory																						

* Parentheses indicate a second drum was filled (associated drum#) but this drum was not sampled.
** Sample composited over top 12" of drummed soil due to auger refusal.

collected for shipment to Envirocare for waste acceptance analysis, and one 50-pound sample was collected for a standard proctor test.

Confirmation samples were analyzed for radionuclides while waste characterization samples were analyzed for radionuclides and a battery of inorganic and organic parameters to assess compliance with the waste acceptance criteria (WAC) for Envirocare (Tables 3-2 and 3-3). Radionuclides analyzed included plutonium-238, plutonium- 239,240, americium-241, uranium-233,234, uranium-235, and uranium-238. Gross alpha and beta were also analyzed. Waste characterization samples were analyzed for the above-noted radiological parameters as well as VOCs; SVOCs; pesticides/herbicides/PCBs; EPA Target Analyte List (TAL) metals; Toxicity Characteristic Leaching Procedure (TCLP) organics and pesticides/herbicides/PCBs; RCRA Reactivity; soil pH; and total organic halogens (TOX). Analytical methods employed are shown in Table 3-3.

3.3 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Confirmation and characterization sampling and analysis conformed to the quality assurance/quality control (QA/QC) procedures identified in the SAP (DOE, 1994c). The sampling strategies and methods as well as the analytical methods identified in Section 3.2 were in accordance with the SAP. QC samples (duplicates, and rinsate and trip blanks) were collected and analyzed as shown in Table 3-2. Data were validated and managed per the Data Management Plan (Appendix B of the SAP).

4.0 ARA RESULTS

This section presents the results of the confirmation and characterization sampling and analysis program. First, data collected to confirm that the hot spots were removed are evaluated with respect to the ARA objectives (Section 4.1). Characterization data for excavated soils are then presented and evaluated against Land Disposal Restriction limits, and are also compared to pre-ARA data to assess the representativeness of this early data (Section 4.2). QA/QC results are presented and discussed in the final subsection (Section 4.3).

Table 3-3

Chemical Analyte Roster

Analytes	Analytical Method
VOCs	SW-846 8240
SVOCs	SW-846 8270
Metals	EPA-CLP TAL List
PCB/PEST/HERB	SW-846 8080/8150
RCRA Reactivity Cyanide/Sulfide	9030/9010
Soil pH	SW-846 9045
TCLP Metals RCRA 8 only	SW-846 6010/7000
TCLP Organics	SW-846 8240A/8270
TCLP PCB/PEST/HERB	SW-846 8080/8150
TOX Analysis	SW-846 9020
Radiological Screening	GRRASP Specific
Plutonium-239, 240	GRRASP Specific
Americium-241	GRRASP Specific
Uranium-233, 234, 235, 238	GRRASP Specific
Gross Alpha and Beta	GRRASP Specific

4.1 ARA PERFORMANCE

Residual radionuclide activities in the soils at the bottom and sides of the hot spot excavations are significantly less than the maximum activities measured in the pre-ARA samples (Table 4-1). At SS100493, the percent residual activities (based on the mean residual activity) for americium-241 and plutonium-239,240 is 0.1 and 0.2%, respectively. This three order of magnitude reduction in activity has served to significantly reduce the potential health risk to workers and the public — the central objective of the ARA. The residual activities of plutonium-239,240 (42.0 pCi/g) and americium-241 (5.7 pCi/g) at the hot spot location are similar in magnitude to the upper limit of the activity range for these radionuclides in non-hot spot surface soils at OU1 (46.7 pCi/g and 6.1 pCi/g, respectively). This implies the estimated carcinogenic risk to a future on-site resident from ingestion of soil and inhalation of dust will approximate 9.8×10^{-6} (refer to Table 2-5 for risk with hot spot removed). The on-site worker estimated carcinogenic risk will accordingly drop to well below 10^{-6}. EPA's acceptable total carcinogenic risk is 10^{-4}.

Uranium isotopes present in hot spots at activities greater than 50 pCi/g were reduced 4 to 500 times their original levels (Table 4-1). Although uranium isotopes did not pose an unacceptable public health threat, these reductions in activity levels mitigate the potential for the spread of uranium contamination via runoff—the secondary objective of the ARA.

4.2 EXCAVATED SOIL CHARACTERIZATION

Samples of the excavated soil were analyzed for a comprehensive list of radionuclides, VOCs, SVOCs, and pesticides/herbicides/PCBs to provide a thorough chemical characterization and to assess compliance with the Envirocare WAC (refer to Tables 3-2 and 3-3).

As shown in Table 4-1, pre-ARA mean radionuclide activities at the hot spots are only comparable to the activities in the excavated soils for SS100193, SS100293, and SS100393. In these cases, it would appear the compositing intervals for the pre-ARA samples are consistent with the depths of soil removed. At 881-16/17 and 881-18/19, only pre-ARA surface scrapes were collected. The uranium activities in these surface scrape samples are considerably higher than in the composite soil samples collected from the excavated soils indicating the surficial

Table 4-1

Pre- and Post-ARA Radionuclide Activities (pCi/g)

Hot Spot	Radionuclide	Pre-ARA Samples		Excavated Soil Samples		Post-ARA Confirmation Samples	
		Mean	Range	Mean	Range	Mean	Range
SS100193	PLUTONIUM-238	NA	NA	5.705	5.705 - 5.705	2.193	0.546 - 4.896
SS100193	PLUTONIUM-239/240	0.103	0.074 - 0.133	0.347	0.347 - 0.347	0.161	0.097 - 0.324
SS100193	AMERICIUM-241	0.039	0.029 - 0.049	0.075	0.075 - 0.075	0.112	0.032 - 0.162
SS100193	URANIUM-233/234	217.5	6.09 - 429	309.7	309.7 - 309.7	67.52	60.63 - 76.65
SS100193	URANIUM-235	7.39	0.176 - 14.6	14.59	14.59 - 14.59	3.155	2.787 - 3.497
SS100193	URANIUM-238	62.69	3.38 - 122	148.7	148.7 - 148.7	32.53	27.05 - 38.74
SS100193	GROSS ALPHA	NA	NA	176	176 - 176	63.68	51.9 - 79.5
SS100193	GROSS BETA	NA	NA	185	185 - 185	63.08	56.4 - 74.3
SS100293	PLUTONIUM-238	NA	NA	8.947	1.489 - 23.23	0.971	0.306 - 2.825
SS100293	PLUTONIUM-239/240	0.454	0.054 - 0.878	0.392	0.106 - 0.903	0.083	0.038 - 0.126
SS100293	AMERICIUM-241	0.127	0.037 - 0.192	0.353	0.029 - 0.895	0.035	0.006 - 0.052
SS100293	URANIUM-233/234	91.22	8.27 - 240	118.1	51.79 - 154.2	52.76	5.331 - 89.25
SS100293	URANIUM-235	2.458	0.301 - 6.23	4.16	1.31 - 5.783	1.58	0.121 - 2.668
SS100293	URANIUM-238	1.226	0.779 - 1.51	3.226	0.834 - 6.632	1.284	0.946 - 1.581
SS100293	GROSS ALPHA	NA	NA	200.1	62.4 - 280	73.55	15.7 - 132
SS100293	GROSS BETA	NA	NA	43.57	35.1 - 51	35.6	28.6 - 44.4
SS100393	PLUTONIUM-238	NA	NA	0.306	0.306 - 0.306	0.512	0.452 - 0.581
SS100393	PLUTONIUM-239/240	18.7	14.7 - 22.7	25.11	25.11 - 25.11	32.25	25.44 - 41.2
SS100393	AMERICIUM-241	3.025	1.9 - 4.15	2.722	2.722 - 2.722	6.387	4.889 - 7.918
SS100393	URANIUM-233/234	1.065	0.64 - 1.49	0.729	0.729 - 0.729	1.134	0.908 - 1.51
SS100393	URANIUM-235	0.081	0.056 - 0.107	0.013	0.013 - 0.013	0.058	0.009 - 0.1
SS100393	URANIUM-238	0.821	0.75 - 0.892	0.737	0.737 - 0.737	0.959	0.818 - 1.071
SS100393	GROSS ALPHA	NA	NA	23.4	23.4 - 23.4	40.7	31 - 55
SS100393	GROSS BETA	NA	NA	31.3	31.3 - 31.3	31.55	29.6 - 33.5
SS100493	PLUTONIUM-238	NA	NA	4.395	0.511 - 8.33	0.988	0.504 - 1.416

NA = Not Analyzed

Table 4-1

Pre- and Post-ARA Radionuclide Activities (pCi/g)

Hot Spot	Radionuclide	Pre-ARA Samples		Excavated Soil Samples		Post-ARA Confirmation Samples	
		Mean	Range	Mean	Range	Mean	Range
SS100493	PLUTONIUM-239/240	11723	6670 - 17400	212.5	20.96 - 446.8	42.01	23.46 - 60.65
SS100493	AMERICIUM-241	2973	2010 - 4260	33.00	3.424 - 70.34	5.712	4.008 - 7.84
SS100493	URANIUM-233/234	6.017	0.91 - 9.68	2.298	1.393 - 3.382	2.359	1.774 - 2.996
SS100493	URANIUM-235	0.997	0.0 - 2.07	0.083	0.03 - 0.241	0.058	0.016 - 0.109
SS100493	URANIUM-238	4.71	1.22 - 8.22	1.847	0.951 - 3.239	2.251	1.141 - 3.427
SS100493	GROSS ALPHA	NA	NA	211.8	27.9 - 776	28.5	21.3 - 41.4
SS100493	GROSS BETA	NA	NA	31.28	28.3 - 35.6	31.98	29.3 - 37.7
881-16/17	PLUTONIUM-238	NA	NA	0.073	0.073 - 0.073	0.105	0.002 - 0.36
881-16/17	PLUTONIUM-239/240	0.3	0.3 - 0.3	0.227	0.227 - 0.227	0.181	0.089 - 0.25
881-16/17	URANIUM-233/234	50	50 - 50	7.211	7.211 - 7.211	4.071	1.358 - 9.441
881-16/17	URANIUM-235	0.0	0.0 - 0.0	0.517	0.517 - 0.517	0.175	0.108 - 0.358
881-16/17	URANIUM-238	1300	1300 - 1300	42.8	42.8 - 42.8	3.203	1.638 - 6.217
881-16/17	GROSS ALPHA	NA	NA	24.7	24.7 - 24.7	17.88	14.8 - 21.500
881-16/17	GROSS BETA	NA	NA	93.7	93.7 - 93.7	34.6	30.3 - 37.200
881-18/19	PLUTONIUM-238	NA	NA	0.043	0.043 - 0.043	0.017	0.001 - 0.030
881-18/19	PLUTONIUM-239/240	0.42	0.42 - 0.42	0.149	0.149 - 0.149	0.167	0.03 - 0.312
881-18/19	URANIUM-233/234	60	60 - 60	3.884	3.884 - 3.884	1.909	1.063 - 3.129
881-18/19	URANIUM-235	12	12 - 12	0.091	0.091 - 0.091	0.099	0.012 - 0.266
881-18/19	URANIUM-238	3000	3000 - 3000	29.06	29.06 - 29.06	6.425	1.29 - 17.059
881-18/19	GROSS ALPHA	NA	NA	24.4	24.4 - 24.4	19.93	14.4 - 30.200
881-18/19	GROSS BETA	NA	NA	67.3	67.3 - 67.3	34.55	25.1 - 50.600

NA = Not Analyzed

nature of the radionuclide contamination at these locations. At SS100493, pre-ARA soil sample radionuclide activities are also considerably higher than the activities of the composite samples collected from the 14 drums of excavated soil. This clearly indicates that the pre-ARA samples (one location to depths of only 10 inches) are not representative of the soils that were excavated (final areal dimensions of the excavation were 6 ft. x 12 ft.).

Toluene and PCE have been detected in the pre-ARA hot spot samples. Of particular note is the presence of PCE in all of the characterization samples from SS100493. This confirms the previous results where PCE was only detected in the samples from this hot spot. In both cases concentrations were low (<200 micrograms per kilogram [μg/kg]). Because 2-butanone, methylene chloride, and trichloroethene are only infrequently detected at low concentrations, often estimated below detection limits, there presence in the excavated soils is uncertain. Although methylene chloride and 2-butanone were not detected in trip or rinsate blanks, they are common laboratory introduced contaminants.

Most of the SVOCs detected are PAHs or phthalates. The ubiquitous presence of PAHs is consistent with the pre-ARA data (Table 2-4) and further supports that the origin of the PAHs is not waste related, but rather, is from urban sources. Bis(2-ethylhexyl)phthalate (BEHP), a plasticizer, was also commonly present in the excavated soil samples. The Phase III RFI/RI determined this compound and other phthlates to be laboratory contaminants because of their frequent appearance in both OU1 and background samples. Any contact of the sample or sample extract with plastic creates potential for phthalate contamination. However, the RFI/RI surface and subsurface soil BEHP concentrations were typically less than 500 μg/kg. The relatively high (mean concentration, 15,800 μg/kg; maximum concentration, 72,000 μg/kg) and consistent concentrations of BEHP in samples from SS100493 indicate BEHP is present in the excavated soil from this location. The BEHP appears to arise from plastic debris in the soil, which was observed during excavation of SS100493.

With respect to the pesticides/PCBs, PCBs (Aroclor-1254) were detected in most of the characterization samples while the pesticides were infrequently detected and at low concentrations (less than 100 μg/kg and typically less than 10 μg/kg). The PCB results are consistent with the pre-ARA data (Table 2-4). The Phase III RFI/RI determined PCBs are

contaminants of OU1 soil. Similar to BEHP, these data suggest PCB may be a component of the wastes released to the soils at the hot spots. However, the concentrations are low and below the Toxic Substance Control Act (TSCA) spill cleanup policy of 25,000 μg/kg in a restricted area (such as OU1). The concentrations are even below the more stringent levels of 10,000 μg/kg (subsurface soils beneath 10 inches) and 1,000 μg/kg (surface soils) for unrestricted areas, e.g., parks, schools, etc.

The Envirocare WAC includes RCRA Land Disposal Restrictions (LDR) for F001 through F005 listed wastes (spent halogenated solvent wastes), the appropriate listing for the excavated soils. As can be seen from Table 4-2, none of the VOC concentrations exceeded the LDR limits. RCRA TCLP tests were also conducted on the samples and the extracts analyzed for a comprehensive list of organics and metals. The extracts did not contain detectable concentrations of the organics; however, they did contain low levels of barium and mercury (Table 4-3). Envirocare has determined the excavated soils meet their WAC based on these data and the analytical data generated by Envirocare from the waste acceptance sample.

4.3 QA/QC RESULTS

All data were validated in accordance with the SAP. With the exception of the data shown in Table 4-4, results were deemed valid or acceptable. The rare occurrence of rejected data indicates laboratory procedure was largely in keeping with the QA/QC requirements of the SAP. The concentration of bis(2-chloroisopropyl)ether in the excavated soils can not be determined because all the data that exist have been rejected. However, this compound is not expected to be present. It is also noted that the data shown in Table 4-4 were all nondetections.

Trip and rinsate blanks, as well as duplicate samples, were collected to assess accuracy and precision of the field data. The blanks did not contain detectable concentrations of any analyte except sample SS00383EG, a trip blank, which contained 1 μg/kg of chloroform. This concentration is estimated below the detection limit of 5 μg/kg and, therefore, may not be a meaningful result. Regardless, the analyte was not detected in the field samples. The trip and rinsate blank results indicate that sample container contamination (trip blank) or cross contamination during sampling are not issues with respect to the data accuracy. Tables 4-5 and

Table 4-2

Organic Compound Concentrations in Excavated Soils*
(ug/kg)

	SS100193		SS100293		SS100393		SS100493		881-16/17		881-18/19		LDR REGULATORY LIMIT F001-F005 Listed Wastes
ANALYTE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	
VOLATILES													
2-BUTANONE	0/1	ND	1/3	ND - 12 J	0/1	ND	0/8	ND - ND	0/1	ND	1/1	11 J	36,000
METHYLENE CHLORIDE	1/1	3 J	3/3	2 J - 3 J	0/1	ND	2/8	ND - 6	1/1	4 J	1/1	3 J	30,000
TETRACHLOROETHENE	1/1	2 J	1/3	ND - 1 J	0/1	ND	8/8	16 - 76	0/1	ND	0/1	ND	6,000
TOLUENE	0/1	ND	1/3	ND - 3 J	0/1	ND	5/8	ND - 6	0/1	ND	0/1	ND	10,000
TRICHLOROETHENE	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 2 J	0/1	ND	0/1	ND	6,000
SEMIVOLATILES													
1,2-BENZENEDICARBOXYLIC ACID							5/5	100 J - 2700 J					NS
1-HEXANOL, 2-ETHYL-							1/1	1900 J					NS
4H-CYCLOPENTA(def)PHENANTHRENE							1/1	110 J					NS
ACENAPHTHENE	0/1	ND	0/3	ND - ND	0/1	ND	2/8	ND - 150 J	0/1	ND	0/1	ND	NS
ANTHRACENE	0/1	ND	0/3	ND - ND	0/1	ND	2/8	ND - 160 J	0/1	ND	0/1	ND	NS
BENZO(a)ANTHRACENE	1/1	78 J	1/3	ND - 63 J	1/1	100 J	3/8	ND - 310 J	1/1	72 J	1/1	54 J	NS
BENZO(a)PYRENE	1/1	86 J	1/3	ND - 61 J	1/1	110 J	2/5	ND - 100 J	1/1	72 J	1/1	63 J	NS
BENZO(b)FLUORANTHENE	1/1	110 J	2/3	ND - 81 J	1/1	140 J	2/6	ND - 670	1/1	170 J	1/1	77 J	NS
BENZO(ghi)PERYLENE	1/1	56 J	1/3	ND - 46 J	0/1	ND	0/4	ND - ND	0/1	ND	1/1	41 J	NS
BENZO(k)FLUORANTHENE	1/1	44 J	0/3	ND - ND	1/1	55 J	0/4	ND - ND	0/1	ND	1/1	35 J	NS
BENZOIC ACID	0/1	ND	0/3	ND - ND	0/1	ND	7/8	ND - 290 J	0/1	ND	1/1	69 J	NS
BIS(2-ETHYLHEXYL)PHTHALATE	0/1	ND	2/3	ND - 76 J	0/1	ND	8/8	210 J - 72000 E	1/1	98 J	1/1	360	NS
CHRYSENE	1/1	97 J	2/3	ND - 69 J	1/1	130 J	5/8	ND - 350 J	1/1	91 J	1/1	65 J	NS
DI-n-BUTYL PHTHALATE	0/1	ND	0/3	ND - ND	0/1	ND	3/8	ND - 190 J	0/1	ND	0/1	ND	NS

* Only detected compounds are listed.
** D/O = Number of detections per number of observations.
J = Estimated value less than detection limit.
E = Concentration exceeds instrument calibration range.
ND = Non-Detect
NS = No Standard

Table 4-2

Organic Compound Concentrations in Excavated Soils*
(ug/kg)

	SS100193		SS100293		SS100393		SS100493		881-16/17		881-18/19		LDR REGULATORY LIMIT F001-F005 Listed Wastes
ANALYTE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	D/O*	RANGE	
DI-n-OCTYL PHTHALATE	0/1	ND	0/3	ND - ND	0/1	ND	6/8	ND - 2000	1/1	64 J	0/1	ND	NS
DIBENZOFURAN	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 52 J	0/1	ND	0/1	ND	NS
FLUORANTHENE	1/1	240 J	2/3	ND - 190 J	1/1	280 J	5/8	ND - 690	0/1	ND	1/1	160 J	NS
FLUORENE	0/1	ND	0/3	ND - ND	0/1	ND	2/8	ND - 120 J	0/1	ND	0/1	ND	NS
INDENO(1,2,3-cd)PYRENE	1/1	61 J	1/3	ND - 52 J	1/1	84 J	0/4	ND - ND	0/1	ND	1/1	41 J	NS
NAPHTHALENE	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 56 J	0/1	ND	0/1	ND	NS
PHENANTHRENE	1/1	170 J	2/3	ND - 160 J	1/1	190 J	5/8	ND - 740	1/1	160 J	1/1	98 J	NS
PYRENE	1/1	190 J	2/3	ND - 140 J	1/1	230 J	5/8	ND - 1700	1/1	230 J	1/1	130 J	NS
PHENOL, 2,6-bis(1,1-dimethylet							1/1	240 J					NS
PHOSPHORIC ACID, tributyl esth									1/1	11000 J			NS
PESTICIDE/PCB's													
4,4'-DDT	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 50	0/1	ND	0/1	ND	NS
AROCLOR-1254	1/1	250	2/3	ND - 140	1/1	97	5/8	ND - 290	1/1	110	1/1	48	NS
DIELDRIN	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 4.3	0/1	ND	0/1	ND	NS
ENDOSULFAN I	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 6.6	0/1	ND	0/1	ND	NS
ENDOSULFAN II	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 18	0/1	ND	0/1	ND	NS
ENDRIN ALDEHYDE	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 72	0/1	ND	0/1	ND	NS
HEPTACHLOR	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 3.6	0/1	ND	0/1	ND	NS
gamma-BHC (LINDANE)	1/1	1.7	0/3	ND - ND	0/1	ND	5/8	ND - 9.4	0/1	ND	1/1	3.2	NS

* Only detected compounds are listed.
** D/O = Number of detections per number of observations.
J = Estimated value less than detection limit.
E = Concentration exceeds instrument calibration range.
ND = Non-Detect
NS = No Standard

Table 4-3

TCLP Characterization Results for Excavated Soils*
(ug/l)

	SS100193		SS100293		SS100393		SS100493		881-16/17		881-18/19		
ANALYTE	D/O**	RANGE	D/O**	RANGE	D/O**	RANGE	D/O**	RANGE	D/O**	RANGE	D/O**	RANGE	LDR REGULATORY LIMIT F001-F005 listed wastes
METALS													
BARIUM	1/1	956	3/3	409 B - 815	1/1	1030	8/8	502 B - 1110	1/1	528 B	1/1	559 B	NS
MERCURY	0/1	ND	0/3	ND - ND	0/1	ND	1/8	ND - 1.2 B	0/1	ND	0/1	ND	NS

* Data for detected analytes only
** D/O = Number of detections per number of observations.
B = Value < method detection limit and > instrument detection limit.
ND = Non-Detect

Table 4-4

Summary of Rejected Data

Hot Spot	Type	Analyte	Number Rejected	Number Analyzed	Percent Rejected
SS100193	REAL	BIS(2-CHLOROISOPROPYL)ETHER	1	1	100
SS100293	REAL	BIS(2-CHLOROISOPROPYL)ETHER	3	3	100
SS100393	REAL	BIS(2-CHLOROISOPROPYL)ETHER	1	1	100
SS100393	REAL	MERCURY	1	1	100
SS100493	REAL	ACETONE	3	8	38
SS100493	REAL	2-BUTANONE, TCLP	2	8	25
SS100493	REAL	BENZO(a)PYRENE	3	8	38
SS100493	REAL	BENZO(b)FLUORANTHENE	2	8	25
SS100493	REAL	BENZO(ghi)PERYLENE	4	8	50
SS100493	REAL	BENZO(k)FLUORANTHENE	4	8	50
SS100493	REAL	BIS(2-CHLOROISOPROPYL)ETHER	8	8	100
SS100493	REAL	DIBENZO(a,h)ANTHRACENE	4	8	50
SS100493	REAL	INDENO(1,2,3-cd)PYRENE	4	8	100
SS100493	REAL	MERCURY	2	8	100
SS100493	TB	2-BUTANONE	1	1	100
881-18/19	REAL	BIS(2-CHLOROISOPROPYL)ETHER	1	1	100

Notes:
Type - Real = Field Sample; TB = Trip Blank

Table 4-5

Sampling Precision Summary for Organic Compounds Detected in Paired Duplicate Samples (ug/kg)

Hot Spot	Sample	Duplicate	Sample Date	Organic Compound	Result for Sample	Result for Duplicate
SS100293	SS00371EG	SS00381EG	29-SEP-94	METHYLENE CHLORIDE	2 J	5 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	TOLUENE	5 U	1 J
SS100293	SS00371EG	SS00381EG	29-SEP-94	BENZO(b)FLUORANTHENE	50 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	BIS(2-ETHYLHEXYL)PHTHALATE	76 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	CHRYSENE	44 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	FLUORANTHENE	96 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	PHENANTHRENE	63 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	PYRENE	78 J	340 U
SS100293	SS00371EG	SS00381EG	29-SEP-94	AROCLOR-1254	140	55

Notes:
Type: REAL = Field Sample; DUP = Field Duplicate
Data Qualifiers: U = Analyzed, not detected; J = Estimated value below detection limit
Validation Qualifiers: JA = Estimated, acceptable; J = Estimated quantity; V = Valid; A = data acceptable with qualifications

4-6 show the data from the field samples and associated duplicates for organics and radionuclides, respectively. As for the organic data, with the exception of Aroclor-1254, results are at or below the detection limit which does not allow for a meaningful comparison. The relative percent difference (RPD) for the Aroclor-1254 data is 87%. This exceeds the quality assurance precision objective of 30% established in the SAP (DOE, 1994c) for all analytical parameters except plutonium/americium (200% for these radionuclides). This RPD result indicates the relatively high heterogeneity of this chemical in the soil. Similar results are noted also for uranium (Table 4-6).

4.4 COMPLIANCE WITH ARARs

The ARA has met the performance objective of achieving compliance with applicable or relevant and appropriate Federal and State requirements (ARARs). As there are no chemical-specific ARARs for the organic and radionuclide contaminants in soils, or location-specific ARARs, compliance with these ARARs was not an issue. However, all federal action-specific ARARs for this ARA were met including: RCRA standards for generators of hazardous waste and for interim status container storage (42 U.S.C. Section 6901 et seq., and 40 CFR Parts 262 and 265); OSHA standards for worker protection during hazardous waste site remediations (29 U.S.C. Section 651 et seq., and 29 CFR Part 1910); Atomic Energy Act (AEA) standards for protecting workers in the handling of radioactive material and standards for storage of radioactive material (42 U.S.C. Section 2201 and 10 CFR Parts 820 and 830, and all applicable DOE Orders pursuant to the AEA). State action-specific ARARs for the ARA are the Colorado Hazardous Waste Act (CHWA) standards for hazardous waste generators and for interim status container storage (CRS Section 25-15-101 to 25-15-313 and 6 CCR Section 1007-3 Parts 262 and 265). The CHWA regulations directly applicable to this ARA are identical to the federal RCRA standards, and, therefore, were also met.

5.0 REFERENCES

DOE (U.S. Department of Energy). 1994a. *Final Proposed Action Memorandum, Hot Spot Removal, Revision 1: Operable Unit No. 1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, September 1994.

Table 4-6

Sampling Precision Summary for Radionuclide Activities in Paired Duplicate Samples (pCi/g)

Hot Spot	Sample	Duplicate	Sample Date	Radionuclide	Activity Sample	Activity Duplicate	Relative Percent Difference*
SS100293	SS00371EG	SS00381EG	29-SEP-94	PLUTONIUM-238	23.23 +/- 3.81	1.99 +/- .343	168.44
SS100293	SS00371EG	SS00381EG	29-SEP-94	PLUTONIUM-239/240	.903 +/- .241	.155 +/- .0554	141.40
SS100293	SS00371EG	SS00381EG	29-SEP-94	AMERICIUM-241	.8949 +/- .125	.08509 +/- .019	165.27
SS100293	SS00371EG	SS00381EG	29-SEP-94	URANIUM-233,-234	154.2454 +/- 6.8465	299.558 +/- 10.9713	64.04
SS100293	SS00371EG	SS00381EG	29-SEP-94	URANIUM-235	5.386 +/- 0.3274	11.7621 +/- 0.5753	74.37
SS100293	SS00371EG	SS00381EG	29-SEP-94	URANIUM-238	2.2124 +/- 0.1757	12.1643 +/- 0.5929	138.44
SS100493	SS00353EG	SS00357EG	30-SEP-94	PLUTONIUM-238	.8601 +/- .184	1.408 +/- .29	48.31
SS100493	SS00353EG	SS00357EG	30-SEP-94	PLUTONIUM-239/240	38.94 +/- 6.01	63.64 +/- 10.4	48.16
SS100493	SS00353EG	SS00357EG	30-SEP-94	AMERICIUM-241	4.96 +/- .495	8.135 +/- .807	48.49
SS100493	SS00353EG	SS00357EG	30-SEP-94	URANIUM-233,-234	2.9955 +/- 0.2665	7.4825 +/- 0.3796	85.65
SS100493	SS00353EG	SS00357EG	30-SEP-94	URANIUM-235	0.1089 +/- 0.0422	0.2394 +/- 0.0446	74.94
SS100493	SS00353EG	SS00357EG	30-SEP-94	URANIUM-238	3.4273 +/- 0.2926	3.1225 +/- 0.1983	9.31
881-18/19	SS00364EG	SS00366EG	03-OCT-94	PLUTONIUM-238	.01986 +/- .0183	.003126 +/- .00989	145.31
881-18/19	SS00364EG	SS00366EG	03-OCT-94	PLUTONIUM-239/240	.3115 +/- .0802	.1778 +/- .0527	54.65
881-18/19	SS00364EG	SS00366EG	03-OCT-94	AMERICIUM-241	.0835 +/- .0228	.06676 +/- .018	22.23
881-18/19	SS00364EG	SS00366EG	03-OCT-94	URANIUM-233,-234	2.1896 +/- 0.278	1.3746 +/- 0.2147	45.73
881-18/19	SS00364EG	SS00366EG	03-OCT-94	URANIUM-235	0.0766 +/- 0.0471	0.0203 +/- 0.0297	116.20
881-18/19	SS00364EG	SS00366EG	03-OCT-94	URANIUM-238	6.0135 +/- 0.5687	3.291 +/- 0.376	58.53

*Relative Percent Difference - Shaded where value exceeds QC criteria (200% for Americium-241, Plutonium-238, Plutonium-239/240; 30% for other radionuclides).

DOE (U.S. Department of Energy). 1994b. *Final Phase III RFI/RI Report: 881 Hillside Area (Operable Unit No. 1).* Department of Energy, Rocky Flats Plant, Golden, Colorado, June 1994.

DOE (U.S. Department of Energy). 1994c. *Final OU1 Sampling and Analysis Plan, Hot Spot Removal.* Department of Energy, Rocky Flats Environmental Technology Site, Golden, Colorado, September 1994.

APPENDIX A

EVALUATION OF RADIOLOGICAL SURVEY INSTRUMENT PERFORMANCE

APPENDIX A

EVALUATION OF RADIOLOGICAL SURVEY INSTRUMENT PERFORMANCE

As discussed in Section 2, the hot spots were identified and located using an HPGe survey instrument and a FIDLER. These devices were also used to guide the excavation of the hot spots. This appendix discusses the apparent performance of these instruments based on a comparison of the laboratory measured data and the field survey data.

As can be seen from Table 2-2, which shows pre-ARA laboratory and HPGe activity data, the HPGe measured activities are generally within a factor of 5 of the laboratory measured activities of the 0- to 0.25-inch surface scrape samples. However, notable exceptions are for americium-241 at SS100493, and for uranium-238 at 881-16/17 and 881-18/19, where laboratory measured activities were considerably higher. This would appear to indicate the apparent correlation of the low activity HPGe and laboratory results is weak. Pre- and post-ARA HPGe data are shown in Table A-1. As can be seen from this table, with the exception of americium-241 at SS100493, and uranium-238 at 881-16/17 and 881-18/19, there is very little difference in the HPGe measurements before and after the hot spots were removed. Because the differences are both positive and negative, it would appear the instrument is neither accurate nor precise enough to measure the activities of these radionuclides at levels less than 50 pCi/g (as measured in the laboratory [refer to Table 4-1; pre- and post-ARA samples]). This lack of accuracy and precision in the HPGe data indicates this instrument is appropriate only for discerning radionuclide contamination at activity levels orders of magnitude greater than background.

The FIDLER was used in the field to assess when radionuclide contaminated soils had been removed at each hot spot location. Measurements taken in the excavations were compared to the mean plus two standard deviations of local background measurements. When the excavation measurements were near or below "background," radionuclide-contaminated soil was considered removed. However, the residual activities of uranium-233,234 at SS100193 and SS100293 and uranium-238 at SS100193 are on the order of 50 pCi/g (refer to Table 4-1 [post-ARA confirmation samples]) which are significantly above background (approximately 3 pCi/g for total uranium). The residual activities of americium-241 and plutonium-239,240 (5.7 pCi/g and 42.0 pCi/g, respectively) at SS100493 are also over two orders of magnitude above background

Table A-1

Pre- and Post-ARA HPGe Survey Results (pCi/g)

Hot Spot	Dominant Radionuclide	Americium-241		Uranium-235		Uranium-238	
		Pre-ARA*	Post-ARA**	Pre-ARA*	Post-ARA**	Pre-ARA*	Post-ARA**
SS100193	Uranium-233,234 and 238	0	0	0.83	0.41	9.74	7.42
SS100293	Uranium-233,234	0.24	0	0.44	0.31	2.99	2.83
SS100393	Plutonium/ Americium	2.19	2.41	0.04	0.18	1.27	0
SS100493	Plutonium/ Americium	47.6	4.22	0.10	0.15	1.72	3.11
881-16/17	Uranium-238	0	0	0.26	0.22	12.6	3.84
881-18/19	Uranium-238	0	0	0.20	0.20	19.4	5.50

* Survey data for SS100193, SS100293, SS100393, and SS100493 were collected using a truck-mounted HPGe spectrometer on 7/21/94. Survey data for 881-16/17 and 881-18/19 were collected using a tripod-mounted HPGe spectrometer on 8/16/94 and 7/26/94, respectively.

** Survey data collected using a tripod-mounted HPGe spectrometer on 9/29/94 (SS100493 and 881-18/19), 9/30/94 (881-16/17), and 10/11/94 (SS100193, SS100293, and SS100393).

NA = Not Analyzed

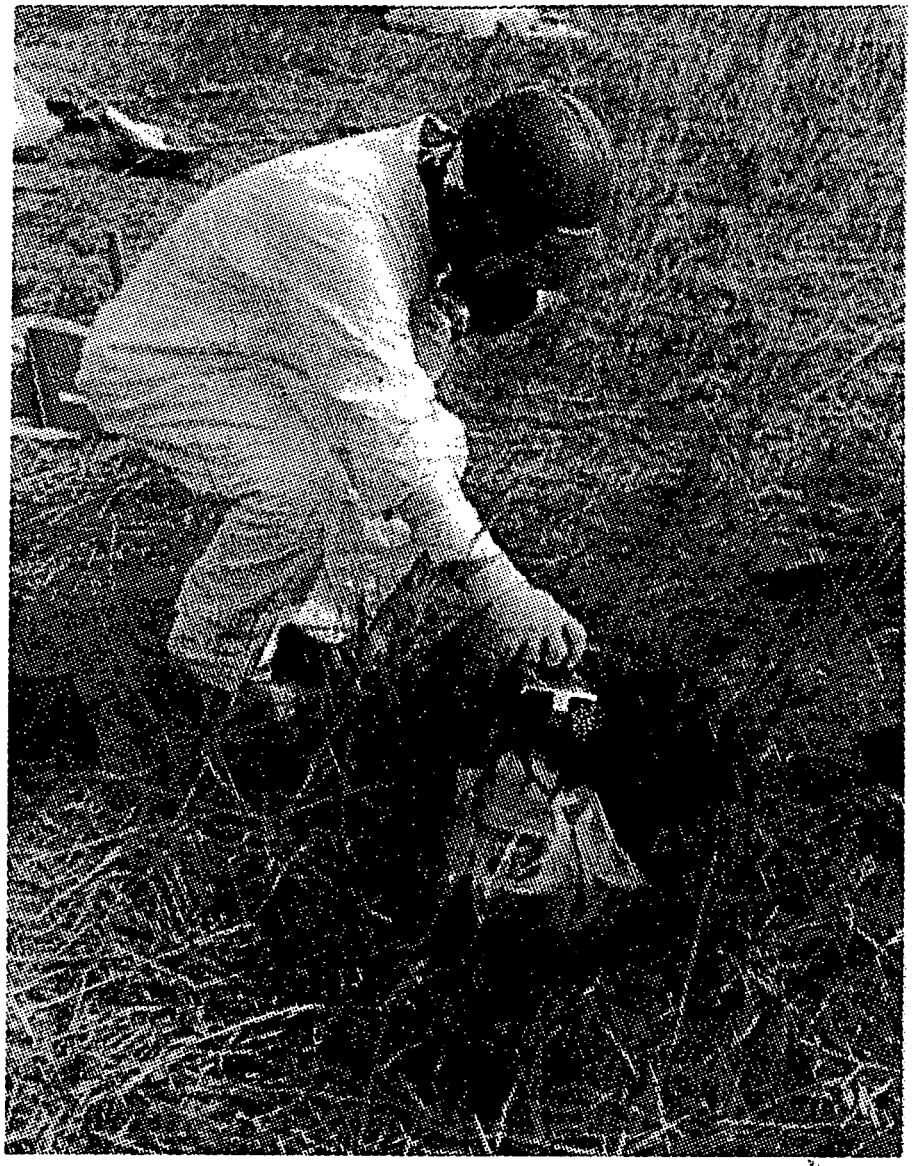
(Table 4-1). Considering the low FIDLER readings in the excavations relative to the background FIDLER readings (Table 3-1), this would indicate that the FIDLER is insensitive to these radionuclide activities even though they are orders of magnitude above background.

Although the FIDLER and HPGe may have limited utility in measuring plutonium, americium, or uranium at activity levels less than 50 pCi/g, they did serve as useful tools to locate significant radionuclide contamination in soils and guide effective removal of the highly contaminated soils. However, because the FIDLER is a much more simple instrument to use in the field, it appears to be the instrument of choice for future surveys at other RFETS locations.

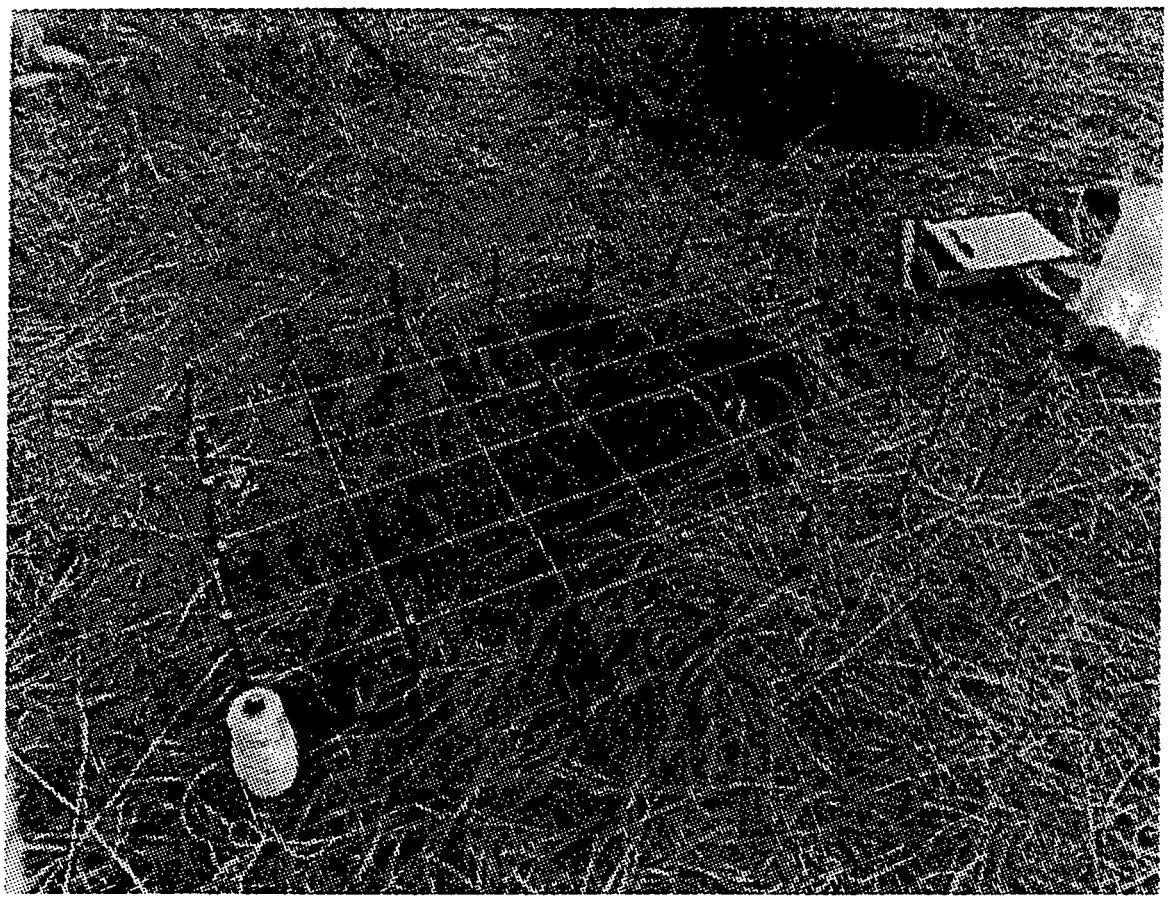
APPENDIX B

ARA PHOTOGRAPHS

Hot Spot Removal Site: Decon and Step-Off Pads

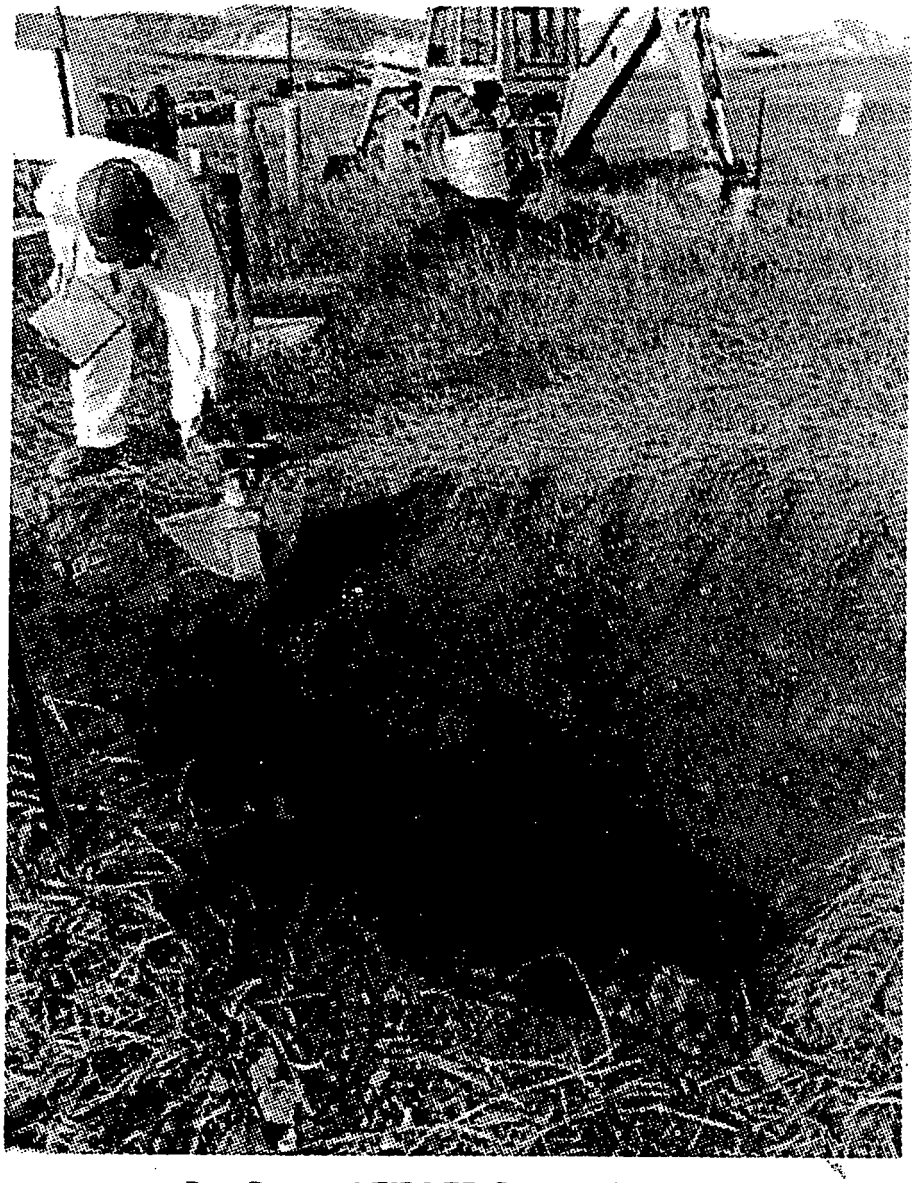


FIDLER Survey During Excavation - SS100293



Confirmation Grid of 881-16/17
SS100293 in Background

Confirmation Sampling of 881-16/17



Post Removal FIDLER Survey of SS100493

APPENDIX C

ANALYTICAL DATA

KEY TO CODES AND QUALIFIERS

TYPE CODES

REAL - PRIMARY FIELD SAMPLE; RNS - RINSATE BLANK; TB - TRIP BLANK; DUP - FIELD DUPLICATE

LAB QUALIFIERS

*	OUTSIDE CONTRACT REQUIRED QC LIMITS - ORGANIC
*	DUP ANALYSIS OUTSIDE CONTROL LIMITS - INORGANIC
+	MSA (STD ADDITIONS) CORRELATION COEFFICIENT < 0.995 - INORGANIC
A	TIC SUSPECTED ALDOL-CONDENSATION PRODUCT - ORGANIC
B	ANALYTE FOUND IN BLANK AND SAMPLE - ORGANIC
B	< METHOD DETECTION LIMIT; > = INSTRUMENT DETECTION LIMIT - INORGANIC
C	PESTICIDE ID CONFIRMED BY GC/MS - ORGANIC
D	COMPOUNDS IDENTIFIED USING SECONDARY DIL FACTOR - ORGANIC
E	CONCENTRATION EXCEEDS CALIBRATION RANGE OF INSTRUMENT - ORGANIC
E	ESTIMATED - INTERFERENCE - INORGANIC
F	ESTIMATED, COMPOUND OFF-SCALE IN BOTH COLUMNS - ORGANIC
G	NATIVE ANALYTE > 4X SPIKE ADDED - INORGANIC
I	INTERFERENCE
J	ESTIMATED VALUE < SAMPLE'S DETECTION LIMIT
K	RESULT IS BETWEEN THE IDL AND THE MDL (CRDL)
M	DUPLICATION INJECTION PRECISION NOT MET - INORGANIC
N	SPIKED RECOVERY NOT WITHIN CONTROL LIMITS - INORGANIC
S	DETERMINED BY MSA
T	COMPOUND FOUND IN TCLP EXTRACT BLANK AND SAMPLE
U	ANALYZED, BUT NOT DETECTED
W	POST-DIGESTION SPIKE OUTSIDE OF CONTROL LIMITS - INORGANIC
X	LAB SOFTWARE FLAG, ENTERED MANUALLY - ORGANIC
X	RESULT BY CALCULATION - GRRASP
Y	INDISTINGUISH ISOMER IN TIC - ORGANIC
Z	QUESTIONABLE ID, MATRIX INTERFERENCE OF COLUMNS - ORGANIC

VALIDATION QUALIFIERS

	INDICATES THE RECORD WAS NOT VALIDATED
A	DATA IS ACCEPTABLE; WITH QUALIFICATIONS
B	INDICATES COMPOUND WAS FOUND IN BLANK AND SAMPLE
E	ASSOCIATED VALUE EXCEEDS CALIBRATION RANGE - DILUTE/REANALYZE
J	ASSOCIATED VALUE IS ESTIMATED QUANTITY
JA	ESTIMATED, ACCEPTABLE
R	DATA IS REJECTED
U	ANALYZED, NOT DETECTED AT OR ABOVE METHOD DETECTION LIMIT
V	DATA IS VALID
VA	DATA IS VALID; ACCEPTABLE WITH QUALIFICATIONS
Y	ANALYTICAL RESULTS IN VALIDATION PROCESS
Z	VALIDATION WAS NOT REQUESTED OR PERFORMED

TCLP METALS
(ug/l)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER
881-16/17	SS00379EG	REAL	29-SEP-94	211 U V	528 B V	14.8 U V	13.6 U JA	169 U JA	1.0 U JA	246 U JA	14.8 U V
881-18/19	SS00380EG	REAL	29-SEP-94	211 U V	559 B V	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100193	SS00369EG	REAL	30-SEP-94	211 U V	956 JA	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100293	SS00370EG	REAL	29-SEP-94	211 U V	613 B V	14.8 U V	13.6 U JA	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100293	SS00371EG	REAL	29-SEP-94	211 U V	815 V	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100293	SS00381EG	DUP	29-SEP-94	211 U V	539 B V	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100293	SS00372EG	REAL	30-SEP-94	211 U V	409 B JA	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100393	SS00374EG	REAL	30-SEP-94	211 U V	1030 JA	14.8 U V	13.6 U V	169 U JA	1.0 U JA	246 U JA	14.8 U V
SS100493	SS00375EG	REAL	27-SEP-94	211 U V	1110 V	14.8 U V	13.6 U V	169 U V	1.7 U JA	246 U JA	14.8 U V
SS100493	SS00376EG	REAL	28-SEP-94	211 U V	745 B V	14.8 U V	13.6 U V	169 U V	2.3 U JA	246 U JA	14.8 U V
SS100493	SS00377EG	REAL	28-SEP-94	211 U V	883 V	14.8 U V	13.6 U V	169 U V	1.0 U JA	246 U JA	14.8 U V
SS100493	SS00378EG	REAL	28-SEP-94	211 U V	586 B V	14.8 U V	13.6 U V	169 U V	1.0 U JA	246 U JA	14.8 U V
SS100493	SS00384EG	REAL	28-SEP-94	211 U V	902 B V	14.8 U V	13.6 U V	169 U V	1.2 U JA	246 U JA	14.8 U V
SS100493	SS00385EG	REAL	28-SEP-94	211 U V	535 B V	14.8 U V	13.6 U V	169 U V	1.3 U JA	246 U JA	14.8 U V
SS100493	SS00386EG	REAL	28-SEP-94	211 U V	644 B V	14.8 U V	13.6 U V	169 U V	1.8 U JA	246 U JA	14.8 U V
SS100493	SS00387EG	REAL	29-SEP-94	211 U V	539 B V	14.8 U V	13.6 U JA	169 U JA	1.2 B JA	246 U JA	14.8 U V

TOTAL METALS
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CESIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	LITHIUM
881-16/17	SS00379EG	REAL	29-SEP-94	7320 V	6.1 U JA	6.3 JA	135 V	0.86 U JA	0.56 B JA	8370 V	6.5 U JA	10.2 V	6.8 B V	17.1 V	13300 V	22.6 V	6.6 B V
881-18/19	SS00380EG	REAL	29-SEP-94	4920 V	6.1 U JA	5.6 JA	85.0 V	0.55 U JA	0.33 U JA	4920 V	5.9 U V	6.4 JA	5.1 B V	10.5 V	8190 V	16.9 V	4.1 B V
SS100193	SS00369EG	REAL	30-SEP-94	9100 V	6.2 U JA	7.1 JA	183 V	1.0 U JA	0.67 B JA	10800 V	6.1 U JA	10.6 V	6.8 B V	16.2 V	13100 V	28.6 V	7.4 B V
SS100293	SS00370EG	REAL	29-SEP-94	6060 V	6.0 U JA	5.6 JA	103 V	0.81 U JA	0.32 U JA	5780 V	5.8 U V	6.7 V	6.2 B V	10.6 V	9730 V	17.6 V	5.1 B V
SS100293	SS00371EG	REAL	29-SEP-94	7160 V	6.0 U JA	6.4 JA	158 V	0.82 U JA	0.62 B JA	6700 V	5.8 U V	9.5 V	8.9 B V	15.8 V	11300 V	21.2 V	5.8 B V
SS100293	SS00381EG	DUP	29-SEP-94	5310 V	6.0 U JA	5.9 JA	105 V	0.81 U JA	0.32 U JA	6280 V	5.7 U V	5.5 JA	6.8 B V	11.2 V	8840 V	18.9 V	5.0 B V
SS100293	SS00372EG	REAL	30-SEP-94	6400 V	5.9 U JA	5.7 JA	84.1 V	0.67 U JA	0.32 U JA	3380 V	5.7 U V	8.3 V	6.8 B V	11.8 V	9820 V	12.6 V	4.4 B V
SS100393	SS00374EG	REAL	30-SEP-94	7860 V	6.0 U JA	6.9 JA	152 V	0.82 U JA	0.51 B JA	11000 V	6.5 U JA	9.3 V	7.1 B V	21.6 V	12700 V	29.4 V	5.2 B V
SS100493	SS00375EG	REAL	27-SEP-94	8790 V	6.3 U JA	6.2 JA	195 V	1.1 U JA	0.75 B JA	21200 V	14.9 U JA	14.6 V	7.6 B V	17.9 V	13800 V	46.8 V	8.3 B V
SS100493	SS00376EG	REAL	28-SEP-94	11300 V	6.3 U JA	8.0 JA	158 V	11.5 V	0.66 B JA	8040 V	6.1 U V	15.2 V	7.6 B V	18.5 V	15000 V	30.2 V	13.9 B V
SS100493	SS00377EG	REAL	28-SEP-94	9520 V	6.1 U JA	7.9 JA	150 V	1.0 U JA	0.65 B JA	9440 V	6.9 U JA	12.1 V	7.1 B V	16.0 V	13300 V	26.9 V	9.9 B V
SS100493	SS00378EG	REAL	28-SEP-94	5690 V	6.1 U JA	5.5 JA	106 V	0.82 U JA	0.71 B JA	6320 V	8.2 U JA	10.2 V	5.4 B V	14.5 V	11200 V	24.6 V	5.2 B V
SS100493	SS00384EG	REAL	28-SEP-94	13500 V	6.2 U JA	7.5 JA	170 V	1.1 U JA	0.33 U JA	6260 V	6.0 U V	14.3 V	7.0 B V	15.8 V	16100 V	16.8 V	9.4 B V
SS100493	SS00385EG	REAL	28-SEP-94	10100 V	6.4 U JA	7.4 JA	139 V	1.1 U JA	0.34 U JA	5960 V	6.1 U V	11.6 V	6.6 B V	15.3 V	13400 V	21.2 V	10.9 B V
SS100493	SS00386EG	REAL	28-SEP-94	9790 V	6.2 U JA	7.4 JA	140 V	1.0 U JA	0.33 U JA	6870 V	5.9 U V	12.6 V	6.1 B V	15.6 V	13300 V	22.0 V	10.3 B V
SS100493	SS00387EG	REAL	29-SEP-94	7760 V	6.2 U JA	6.1 JA	119 V	0.91 U JA	0.40 B JA	5840 V	5.9 U V	9.9 V	6.1 B V	13.7 V	11300 V	22.5 V	7.2 B V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	MAGNESIUM	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	STRONTIUM	THALLIUM	TIN	VANADIUM	ZINC
881-16/17	SS00379EG	REAL	29-SEP-94	2200 V	259 V	0.050 U JA	1.2 U V	13.9 V	1730 V	0.77 U JA	0.82 U V	307 B V	45.7 V	0.67 U JA	7.5 U V	16.0 JA	51.8 JA
881-18/19	SS00380EG	REAL	29-SEP-94	1470 V	198 V	0.050 U V	1.2 U V	8.1 B V	1220 V	0.91 U JA	0.83 U V	194 B V	29.0 B V	0.68 U JA	7.6 U V	16.6 JA	33.0 JA
SS100193	SS00369EG	REAL	30-SEP-94	2740 V	276 V	3.6 JA	1.2 U V	15.6 V	1690 V	0.99 U JA	0.83 U V	889 B V	54.2 V	0.68 U JA	340 V	19.9 JA	60.8 JA
SS100293	SS00370EG	REAL	29-SEP-94	1780 V	250 V	0.050 U JA	1.2 U V	10.1 V	1410 V	1.1 U JA	0.81 U V	1570 V	42.2 B V	0.66 U JA	7.4 U V	14.9 JA	39.8 JA
SS100293	SS00371EG	REAL	29-SEP-94	2140 V	490 V	0.050 U JA	1.2 U V	15.1 V	1640 V	0.94 U JA	0.82 U V	257 B V	41.3 B V	0.67 U JA	8.4 B V	18.6 JA	45.1 JA
SS100293	SS00381EG	DUP	29-SEP-94	1790 V	266 V	0.050 U V	1.2 U V	10.0 V	1290 V	1.1 U JA	0.81 U V	1940 V	50.3 V	0.66 U JA	7.3 U V	18.0 JA	37.8 JA
SS100293	SS00372EG	REAL	30-SEP-94	1700 V	272 V	0.050 U V	1.2 U V	10.9 V	1390 V	1.0 U JA	0.80 U V	185 B V	26.8 B V	0.66 U JA	7.3 U V	21.1 JA	33.2 JA
SS100393	SS00374EG	REAL	30-SEP-94	2780 V	455 V	0.050 U R	1.2 U V	13.2 V	2200 V	1.4 U JA	0.82 U V	175 B V	31.6 B V	0.67 U JA	7.4 U V	23.1 JA	63.5 JA
SS100493	SS00375EG	REAL	27-SEP-94	2710 V	274 V	0.060 U R	1.2 U V	13.8 V	2010 V	1.3 U JA	1.5 B V	107 B V	103 V	0.69 U JA	7.7 U V	23.2 JA	70.3 JA
SS100493	SS00376EG	REAL	28-SEP-94	2900 V	266 V	4.9 V	1.2 U V	16.1 V	1940 V	1.5 U JA	0.85 U V	109 B V	52.9 V	0.70 U JA	7.8 U V	27.7 JA	64.8 JA
SS100493	SS00377EG	REAL	28-SEP-94	2550 V	246 V	0.19 V	1.2 U V	14.2 V	1860 V	1.4 U JA	0.82 U V	760 B V	58.1 V	0.67 U JA	7.5 U V	25.2 JA	60.2 JA
SS100493	SS00378EG	REAL	28-SEP-94	1910 V	210 V	0.050 U R	1.2 U V	11.9 V	1370 V	0.62 U JA	0.82 U V	162 B V	43.8 V	0.67 U JA	7.5 U V	15.8 JA	48.2 JA
SS100493	SS00384EG	REAL	28-SEP-94	3500 V	297 V	1.5 JA	1.2 U V	16.3 V	1480 V	1.1 U JA	0.84 U V	741 B V	57.3 V	0.69 U JA	7.7 U V	28.8 JA	51.8 JA
SS100493	SS00385EG	REAL	28-SEP-94	2710 V	235 V	9.0 JA	1.3 U V	13.0 V	1570 V	1.2 U JA	0.86 U V	580 B V	48.0 V	0.71 U JA	7.9 U V	28.3 JA	47.0 JA
SS100493	SS00386EG	REAL	28-SEP-94	2610 V	267 V	15.2 JA	1.2 U V	11.7 V	1620 V	0.90 U JA	0.84 U V	132 B V	47.7 V	0.68 U JA	7.6 U V	25.5 JA	49.9 JA
SS100493	SS00387EG	REAL	29-SEP-94	2250 V	242 V	1.4 JA	1.2 U V	11.3 V	1290 V	1.2 U JA	0.96 B V	344 B V	44.2 V	0.68 U JA	7.6 U V	21.5 JA	47.4 JA

RADIONUCLIDES
(pCi/g)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	AMERICIUM-241	GROSS ALPHA	GROSS BETA	PLUTONIUM-238	PLUTONIUM-239,240	URANIUM-233,234	URANIUM-235	URANIUM-238
881-16/17	SS00379EG	REAL	29-SEP-94	.04126 Y	24.7 V	93.7 V	.07278 Y	.2271 Y	7.2106 V	0.5169 V	42.796 V
881-16/17	SS00358EG	REAL	30-SEP-94	02309 Y	14.8 V	30.3 V	.02294 Y	.08925 Y	1.3576 V	0.1252 V	1.9413 V
881-16/17	SS00359EG	REAL	30-SEP-94	.0537 Y	21.5 V	37.2 V	.3599 Y	.25 Y	9.4408 V	0.3584 V	6.2173 V
881-16/17	SS00360EG	REAL	30-SEP-94	.04022 Y	17.5 V	34.3 V	.00167J Y	.1976 Y	2.6051 V	0.1101 V	1.6383 V
881-16/17	SS00361EG	REAL	30-SEP-94	.03619 Y	17.7 V	36.6 V	.03393J Y	.1877 Y	2.8796 V	0.1079 V	3.0133 V
881-18/19	SS00362EG	REAL	03-OCT-94	.5986 Y	30.2 V	50.6 V	.00136J Y	.02988 Y	3.1288 V	0.2658 V	17.058 V
881-18/19	SS00363EG	REAL	03-OCT-94	.7351 Y	19.1 V	25.1 V	.03007 Y	.08144 Y	1.063 V	0.0425 V	1.2898 V
881-18/19	SS00364EG	REAL	03-OCT-94	.0835 Y	16 V	32.5 V	.01986J Y	.3115 Y	2.1896 A	0.0766 A	6.0135 A
881-18/19	SS00365EG	REAL	03-OCT-94	.1236 Y	14.4 V	30 V	.0166 Y	.2446 Y	1.2539 V	0.0118 V	1.3367 V
881-18/19	SS00366EG	DUP	03-OCT-94	.06676 Y	16.2 V	33.2 V	.00312J Y	.1778 Y	1.3746 A	0.0203 A	3.291 A
881-18/19	SS00380EG	REAL	29-SEP-94	.7572 Y	24.4 V	67.3 V	.04294 Y	.1489 Y	3.8837 V	0.0905 V	29.062 V
SS100193	SS0.0TO.25	REAL	03-OCT-94	0.0294 Y				0.0735 Y	6.09 V	0.176 V	3.38 V
SS100193	SS0.0TO1.4	REAL	03-OCT-94	0.0493 Y				0.133 Y	429 V	14.6 V	122 V
SS100193	SS00341EG	REAL	03-OCT-94	.1618 Y	79.5 V	64.3 V	1.436 Y	.09735 Y	71.717 V	3.288 V	38.740 V
SS100193	SS00342EG	REAL	03-OCT-94	.1424 Y	67.7 V	74.3 V	1.895 Y	.3243 Y	76.645 V	2.7872 V	33.647 V
SS100193	SS00343EG	REAL	03-OCT-94	.03167 Y	55.6 V	57.3 V	.546 Y	.1081 Y	61.085 V	3.4967 V	27.046 V
SS100193	SS00344EG	REAL	03-OCT-94	.1134 Y	51.9 V	56.4 V	4.896 Y	.1124 Y	60.629 V	3.0492 V	30.673 V
SS100193	SS00369EG	REAL	30-SEP-94	.07543 Y	176 V	185 V	5.705 Y	.347 Y	309.67 V	14.589 V	148.69 V
SS100293	SS0.0TO.25	REAL	03-OCT-94	0.153 Y				0.429 Y	25.4 V	0.843 V	1.39 V
SS100293	SS0.0TO2.0	REAL	03-OCT-94	0.192 Y				0.878 Y	240 V	6.23 V	1.51 V
SS100293	SS0.0TO3.7	REAL	03-OCT-94	0.0372 Y				0.0539 Y	8.27 V	0.301 V	0.779 V
SS100293	SS00345EG	REAL	03-OCT-94	.00570J Y	104 V	44.4 V	.3056 Y	.03844 Y	89.251 V	2.6681 V	1.5809 V
SS100293	SS00346EG	REAL	03-OCT-94	.04805 Y	132 V	38.6 V	2.825 Y	.1263 Y	83.360 V	2.3311 V	1.296 V
SS100293	SS00347EG	REAL	03-OCT-94	.05205 Y	15.7 V	28.6 V	.3985 Y	.1194 Y	5.3309 V	0.1212 V	0.9462 V
SS100293	SS00348EG	REAL	03-OCT-94	.03285 Y	42.5 V	30.8 V	.3558 Y	.04751 Y	33.088 V	1.2008 V	1.3131 V
SS100293	SS00370EG	REAL	29-SEP-94	.1352 Y	280 V	51 V	2.121 Y	.1662 Y	148.21 V	5.7829 V	6.6316 V
SS100293	SS00371EG	REAL	29-SEP-94	.8949 Y	258 V	44.6 V	23.23 Y	.903 Y	154.24 V	5.386 V	2.2124 V
SS100293	SS00381EG	DUP	29-SEP-94	.08509 Y	249 V	48 V	1.99 Y	.155 Y	299.55 V	11.762 V	12.164 V
SS100293	SS00372EG	REAL	30-SEP-94	.0294 Y	62.4 V	35.1 V	1.489 Y	.1061 Y	51.792 V	1.3103 V	0.8338 V
SS100393	SS0.0TO.25	REAL	03-OCT-94	4.15 Y				22.7 Y	1.49 V	0.107 V	0.892 V
SS100393	SS0.0TO1.0	REAL	03-OCT-94	1.9 Y				14.7 Y	0.64 V	0.0557 V	0.75 V
SS100393	SS00349EG	REAL	03-OCT-94	7.918 Y	55 V	33.5 V	.5814 Y	41.2 Y	0.9076 V	0.0866 V	0.818 V
SS100393	SS00350EG	REAL	03-OCT-94	7.345 Y	38.9 V	31.6 V	.4805 Y	34.7 Y	1.1138 V	0.0086 V	1.0149 V
SS100393	SS00351EG	REAL	03-OCT-94	4.889 Y	31 V	29.6 V	.5348 Y	27.66 Y	1.0065 V	0.0361 V	0.9315 V
SS100393	SS00352EG	REAL	03-OCT-94	5.396 Y	37.9 V	31.5 V	.4518 Y	25.64 Y	1.5097 V	0.1004 V	1.0712 V
SS100393	SS00374EG	REAL	30-SEP-94	2.722 Y	23.4 V	31.3 V	.3055 Y	25.11 Y	0.7288 A	0.0126 A	0.7372 A
SS100493	SS0.75	REAL	03-OCT-94	2650 Y				11100 Y	9.68 V	0 V	4.69 V
SS100493	SS4.0TO5.0	REAL	03-OCT-94	4260 Y				17400 Y	7.46 V	0.92 V	8.22 V
SS100493	SS9.0TO10.0	REAL	03-OCT-94	2010 Y				6670 Y	0.91 V	2.07 V	1.22 V
SS100493	SS00375EG	REAL	27-SEP-94	19.8 Y	40.8 V	32.7 V	3.485 Y	126.2 Y	3.3815 V	0.1158 V	3.2387 V
SS100493	SS00376EG	REAL	28-SEP-94	64.45 V	776 V	32 V	8.108 V	385.6 V	2.9681 V	0.2414 V	1.89 V
SS100493	SS00377EG	REAL	28-SEP-94	70.34 Y	135 V	35 V	8.33 Y	426.8 Y	3.2646 V	0.0756 V	3.0541 V
SS100493	SS00378EG	REAL	28-SEP-94	61.35 Y	112 V	28.3 V	8.162 Y	446.8 Y	2.2346 V	0.045 V	1.4834 V
SS100493	SS00384EG	REAL	28-SEP-94	33.39 Y	444 V	35.6 V	4.859 Y	221 Y	1.3929 V	0.0361 V	0.9508 V
SS100493	SS00385EG	REAL	28-SEP-94	7.27 Y	34.7 V	28.5 V	1.11 Y	48.63 Y	1.7552 V	0.0653 V	1.2642 V
SS100493	SS00386EG	REAL	28-SEP-94	4.005 Y	35.1 V	30.2 V	.5968 Y	24.02 Y	1.9029 V	0.0512 V	1.6596 V
SS100493	SS00387EG	REAL	29-SEP-94	3.424 Y	27.9 V	29.2 V	.5107 Y	20.96 Y	1.465 V	0.0298 V	1.2316 V
SS100493	SS00353EG	REAL	30-SEP-94	4.96 Y	21.3 V	31.6 V	.8601 Y	38.94 Y	2.9955 A	0.1089 A	3.4273 A
SS100493	SS00354EG	REAL	30-SEP-94	4.008 Y	26.8 V	29.3 V	.9044 Y	23.46 Y	1.9461 V	0.0156 V	1.1841 V
SS100493	SS00355EG	REAL	30-SEP-94	7.84 Y	41.4 V	37.7 V	1.416 Y	60.65 Y	2.7198 A	0.0816 A	3.253 A
SS100493	SS00356EG	REAL	30-SEP-94	6.04 Y	24.5 V	29.3 V	1.17 Y	45 Y	1.7738 V	0.0269 V	1.1406 V
SS100493	SS00357EG	DUP	30-SEP-94	8.135 Y	23.2 V	29.2 V	1.408 Y	63.64 Y	7.4825 V	0.2394 V	3.1225 V

TCLP VOLATILES
(ug/l)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	1,2-DICHLORO-ETHANE	CHLORO-BENZENE	TETRACHLORO-ETHENE	CARBON TETRACHLORIDE	CHLOROFORM	BENZENE	VINYL CHLORIDE	1,1-DICHLORO-ETHENE	2-BUTANONE	TRICHLORO-ETHENE
881-16/17	SS00379EG	REAL	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
881-18/19	SS00380EG	REAL	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100193	SS00369EG	REAL	30-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100293	SS00370EG	REAL	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100293	SS00371EG	REAL	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100293	SS00381EG	DUP	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100293	SS00372EG	REAL	30-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100393	SS00374EG	REAL	30-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00375EG	REAL	27-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00376EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00377EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U R	50 U V
SS100493	SS00378EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00384EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00385EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V
SS100493	SS00386EG	REAL	28-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U R	50 U V
SS100493	SS00387EG	REAL	29-SEP-94	50 U V	50 U V	50 U V	50 U V	50 U V	50 U V	100 U V	50 U V	100 U V	50 U V

VOLATILE ORGANICS
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	1,1,1-TRI-CHLORO-ETHANE	1,1,2,2-TETRA-CHLORO-ETHANE	1,1,2-TRI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHANE	1,1-DI-CHLORO-ETHENE	1,2-DI-CHLORO-ETHANE	1,2-DI-CHLORO-PROPANE	2 BUTA-NONE	2-CHLORO-ETHYL VINYL ETHER	2-HEXA-NONE	4-METHYL -2- PENTANONE	ACETONE	BENZENE	BROMO-DICHLORO-METHANE
881-16/17	SS00379EG	REAL	29-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	54 U V	54 U V	110 U JA	5 U V	5 U V
881-18/19	SS00380EG	REAL	29-SEP-94	5 U V	5 U JA	5 U V	5 U V	5 U V	5 U V	5 U V	11 J A	11 U V	53 U JA	53 U JA	110 U JA	5 U V	5 U V
SS100193	SS00369EG	REAL	30-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	53 U V	53 U V	110 U JA	5 U V	5 U V
SS100293	SS00370EG	REAL	29-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	53 U V	53 U V	110 U JA	5 U V	5 U V
SS100293	SS00371EG	REAL	29-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	54 U V	54 U V	110 U JA	5 U V	5 U V
SS100293	SS00381EG	DUP	29-SEP-94	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	110 U JA	11 U JA	53 U JA	53 U JA	110 U JA	5 U JA	5 U JA
SS100293	SS00372EG	REAL	30-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	12 J A	11 U V	53 U V	53 U V	110 U JA	5 U V	5 U V
SS100393	SS00374EG	REAL	30-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	54 U V	54 U V	110 U JA	5 U V	5 U V
SS100493	SS00375EG	REAL	27-SEP-94	6 U V	6 U V	6 U V	6 U V	6 U V	6 U V	6 U V	110 U V	11 U V	56 U V	56 U V	110 U R	6 U V	6 U V
SS100493	SS00376EG	REAL	28-SEP-94	6 U JA	6 U JA	6 U JA	6 U V	6 U V	6 U V	6 U JA	110 U V	11 U V	56 U JA	56 U JA	110 U JA	6 U JA	6 U JA
SS100493	SS00377EG	REAL	28-SEP-94	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	110 U JA	11 U JA	54 U JA	54 U JA	110 U JA	5 U JA	5 U JA
SS100493	SS00378EG	REAL	28-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	54 U V	54 U V	110 U R	5 U V	5 U V
SS100493	SS00384EG	REAL	28-SEP-94	6 U V	6 U V	6 U V	6 U V	6 U V	6 U V	6 U V	110 U V	11 U V	56 U V	56 U V	110 U JA	6 U V	6 U V
SS100493	SS00385EG	REAL	28-SEP-94	6 U JA	6 U JA	6 U JA	6 U V	6 U V	6 U V	6 U JA	110 U V	11 U V	57 U JA	57 U JA	110 U R	6 U JA	6 U JA
SS100493	SS00386EG	REAL	28-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	55 U V	55 U V	110 U JA	5 U V	5 U V
SS100493	SS00387EG	REAL	29-SEP-94	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	110 U V	11 U V	55 U V	55 U V	110 U JA	5 U V	5 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	BROMO-FORM	BROMO-METHANE	CARBON DISULFIDE	CARBON TETRA-CHLORIDE	CHLORO-BENZENE	CHLORO-ETHANE	CHLORO-FORM	CHLORO-METHAN	DIBROMO-CHLORO-METHANE	ETHYL-BENZENE	METHYLENE CHLORIDE	STYRENE	TETRA-CHLORO-ETHENE	TOLUENE
881-16/17	SS00379EG	REAL	29-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	4 J A	5 U V	5 U V	5 U V
881-18/19	SS00380EG	REAL	29-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U JA	11 U V	5 U V	11 U V	5 U V	5 U JA	3 J A	5 U JA	5 U JA	5 U JA
SS100193	SS00369EG	REAL	30-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	3 J A	5 U V	2 J A	5 U V
SS100293	SS00370EG	REAL	29-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	3 J A	5 U V	5 U V	5 U V
SS100293	SS00371EG	REAL	29-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	2 J A	5 U V	5 U V	5 U V
SS100293	SS00381EG	DUP	29-SEP-94	5 U JA	11 U JA	5 U JA	5 U JA	5 U JA	11 U JA	5 U JA	11 U JA	5 U JA	5 U JA	5 U JA	5 U JA	5 U JA	1 J A
SS100293	SS00372EG	REAL	30-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	3 J A	5 U V	1 J A	3 J A
SS100393	SS00374EG	REAL	30-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SS100493	SS00375EG	REAL	27-SEP-94	6 U V	11 U V	6 U V	6 U V	6 U V	11 U V	6 U V	11 U V	6 U V	6 U V	3 J A	6 U V	76 V	6 U V
SS100493	SS00376EG	REAL	28-SEP-94	6 U JA	11 U V	6 U V	6 U JA	6 U JA	11 U V	6 U V	11 U V	6 U JA	6 U JA	6 V	6 U JA	19 JA	6 JA
SS100493	SS00377EG	REAL	28-SEP-94	5 U JA	11 U JA	5 U JA	5 U JA	5 U JA	11 U JA	5 U JA	11 U JA	5 U JA	5 U JA	22 U JA	5 U JA	25 JA	4 J A
SS100493	SS00378EG	REAL	28-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	16 U JA	5 U V	16 V	6 V
SS100493	SS00384EG	REAL	28-SEP-94	6 U V	11 U V	6 U V	6 U V	6 U V	11 U V	6 U V	11 U V	6 U V	6 U V	6 U JA	6 U V	24 V	6 U V
SS100493	SS00385EG	REAL	28-SEP-94	6 U JA	11 U V	6 U V	6 U JA	6 U JA	11 U V	6 U V	11 U V	6 U JA	6 U JA	6 U JA	6 U JA	61 JA	1 J A
SS100493	SS00386EG	REAL	28-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	5 U JA	5 U V	35 V	1 J A
SS100493	SS00387EG	REAL	29-SEP-94	5 U V	11 U V	5 U V	5 U V	5 U V	11 U V	5 U V	11 U V	5 U V	5 U V	20 U JA	5 U V	29 V	5 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	TOTAL XYLENES	TRICHLORO-ETHENE	VINYL ACETATE	VINYL CHLORIDE	cis-1,3-DI-CHLORO-PROPENE	trans-1,2-DICHLORO-ETHENE	trans-1,3 -DICHLORO-PROPENE
881-16/17	SS00379EG	REAL	29-SEP-94	5 U V	5 U V	54 U V	11 U V	5 U V	5 U V	5 U V
881-18/19	SS00380EG	REAL	29-SEP-94	5 U JA	5 U V	53 U V	11 U V	5 U V	5 U V	5 U V
SS100193	SS00369EG	REAL	30-SEP-94	5 U V	5 U V	53 U V	11 U V	5 U V	5 U V	5 U V
SS100293	SS00370EG	REAL	29-SEP-94	5 U V	5 U V	53 U V	11 U V	5 U V	5 U V	5 U V
SS100293	SS00371EG	REAL	29-SEP-94	5 U V	5 U V	54 U V	11 U V	5 U V	5 U V	5 U V
SS100293	SS00381EG	DUP	29-SEP-94	5 U JA	5 U JA	53 U JA	11 U JA	5 U JA	5 U JA	5 U JA
SS100293	SS00372EG	REAL	30-SEP-94	5 U V	5 U V	53 U V	11 U V	5 U V	5 U V	5 U V
SS100393	SS00374EG	REAL	30-SEP-94	5 U V	5 U V	54 U V	11 U V	5 U V	5 U V	5 U V
SS100493	SS00375EG	REAL	27-SEP-94	6 U V	2 J A	56 U V	11 U V	6 U V	6 U V	6 U V
SS100493	SS00376EG	REAL	28-SEP-94	6 U JA	6 U JA	56 U JA	11 U V	6 U JA	6 U V	6 U JA
SS100493	SS00377EG	REAL	28-SEP-94	5 U JA	5 U JA	54 U JA	11 U JA	5 U JA	5 U JA	5 U JA
SS100493	SS00378EG	REAL	28-SEP-94	5 U V	5 U V	54 U V	11 U V	5 U V	5 U V	5 U V
SS100493	SS00384EG	REAL	28-SEP-94	6 U V	6 U V	56 U V	11 U V	6 U V	6 U V	6 U V
SS100493	SS00385EG	REAL	28-SEP-94	6 U JA	6 U JA	57 U JA	11 U V	6 U JA	6 U V	6 U JA
SS100493	SS00386EG	REAL	28-SEP-94	5 U V	5 U V	55 U V	11 U V	5 U V	5 U V	5 U V
SS100493	SS00387EG	REAL	29-SEP-94	5 U V	5 U V	55 U V	11 U V	5 U V	5 U V	5 U V

TCLP SEMIVOLATILES
(ug/l)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	1,4-DI-CHLORO-BENZENE	2,4,5-TRI-CHLORO-PHENOL	2,4,6-TRI-CHLORO-PHENOL	2,4-DI-NITRO-TOLUENE	2-METHYL-PHENOL	HEXA-CHLORO-BENZENE	HEXA-CHLORO-BUTADIENE	HEXA-CHLORO-ETHANE	NITRO-BENZENE	PENTA-CHLORO-PHENOL	PYRIDINE	m+p CRESOL
881-16/17	SS00379EG	REAL	29-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
881-18/19	SS00380EG	REAL	29-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100193	SS00369EG	REAL	30-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100293	SS00370EG	REAL	29-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100293	SS00371EG	REAL	29-SEP-94	40 U JA	40 U V	40 U V	40 U V	40 U JA	40 U V	40 U JA	40 U JA	40 U JA	200 U V	40 U V	40 U JA
SS100293	SS00381EG	DUP	29-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100293	SS00372EG	REAL	30-SEP-94	40 U JA	40 U V	40 U V	40 U V	40 U JA	40 U V	40 U JA	40 U JA	40 U JA	200 U V	40 U V	40 U JA
SS100393	SS00374EG	REAL	30-SEP-94	40 U JA	40 U V	40 U V	40 U V	40 U JA	40 U V	40 U V	40 U JA	40 U V	200 U V	40 U V	40 U JA
SS100493	SS00375EG	REAL	27-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00376EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00377EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00378EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00384EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00385EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00386EG	REAL	28-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V
SS100493	SS00387EG	REAL	29-SEP-94	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	40 U V	200 U V	40 U V	40 U V

SEMIVOLATILE ORGANICS
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	1,2,4-TRI-CHLORO-BENZENE	1,2-Benzene-dicarboxylic Acid	1,2-DI-CHLORO-BENZENE	1,3-DI-CHLORO-BENZENE	1,4-DI-CHLORO-BENZENE	1-Hexanol, 2-ethyl -	2,4,5-TRI-CHLORO-PHENOL	2,4,6-TRI-CHLORO-PHENOL	2,4-DI-CHLORO-PHENOL	2,4-DI-METHYL-PHENOL	2,4-DI-NITRO-PHENOL	2,4-DI-NITRO-TOLUENE
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA		360 U JA	360 U JA	360 U JA		360 U JA	360 U JA	360 U JA	360 U JA	1700 U JA	360 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	350 U V		350 U V	350 U V	350 U V		350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V
SS100193	SS00369EG	REAL	30-SEP-94	360 U V		360 U V	360 U V	360 U V		360 U V	360 U V	360 U V	360 U V	1800 U V	360 U V
SS100293	SS00370EG	REAL	29-SEP-94	350 U V		350 U V	350 U V	350 U V		350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V
SS100293	SS00371EG	REAL	29-SEP-94	350 U V		350 U V	350 U V	350 U V		340 U V	340 U V	340 U V	340 U V	1700 U V	340 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V		340 U V	340 U V	340 U V		340 U V	340 U V	340 U V	340 U V	1700 U V	340 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V		340 U V	340 U V	340 U V		350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V
SS100393	SS00374EG	REAL	30-SEP-94	350 U V		350 U V	350 U V	350 U V		370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V
SS100493	SS00375EG	REAL	27-SEP-94	370 U V	250 J Z	370 U V	370 U V	370 U V		370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V
SS100493	SS00376EG	REAL	28-SEP-94	370 U V	100 J Z	370 U V	370 U V	370 U V		350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V
SS100493	SS00377EG	REAL	28-SEP-94	350 U V	730 J Z	350 U V	350 U V	350 U V		360 U V	360 U V	360 U V	360 U V	1700 U V	360 U V
SS100493	SS00378EG	REAL	28-SEP-94	360 U V	2700 J Z	360 U V	360 U V	360 U V	1900 J Z	360 U V	360 U V	360 U V	360 U V	1800 U V	370 U V
SS100493	SS00384EG	REAL	28-SEP-94	370 U V		370 U V	370 U V	370 U V		370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V		370 U V	370 U V	370 U V		370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U V	260 J Z	360 U V	360 U V	360 U V		360 U V	360 U V	360 U V	360 U V	1800 U V	360 U V
SS100493	SS00387EG	REAL	29-SEP-94	360 U V		360 U V	360 U V	360 U V		360 U V	360 U V	360 U V	360 U V	1700 U V	360 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	2,6-DI-NITRO-TOLUENE	2-CHLORO-NAPHTH-ALENE	2-CHLORO-PHENOL	2-METHYL-NAPHTH-ALENE	2-METHYL-PHENOL	2-NITRO-ANILINE	2-NITRO-PHENOL	3,3'-DI-CHLORO-BENZIDINE	3-NITRO-ANILINE	4,6-DINITRO-2-METHYL-PHENOL	4-CHLORO-3-METHYL-PHENOL	4-CHLORO-ANILINE
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	1700 U JA	360 U JA	710 U JA	1700 U JA	1700 U JA	710 U JA	710 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V	700 U V	1700 U V	1700 U V	700 U V	700 U V
SS100193	SS00369EG	REAL	30-SEP-94	360 U V	360 U V	360 U V	360 U V	360 U V	1800 U V	360 U V	720 U V	1800 U V	1800 U V	720 U V	720 U V
SS100293	SS00370EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V	700 U V	1700 U V	1700 U V	700 U V	700 U V
SS100293	SS00371EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V	700 U V	1700 U V	1700 U V	700 U V	700 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V	340 U V	340 U V	340 U V	340 U V	1700 U V	340 U V	690 U V	1700 U V	1700 U V	690 U V	690 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V	340 U V	340 U V	340 U V	340 U V	1700 U V	340 U V	690 U V	1700 U V	1700 U V	690 U V	690 U V
SS100393	SS00374EG	REAL	30-SEP-94	350 U V	350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V	710 U V	1700 U V	1700 U V	710 U V	710 U V
SS100493	SS00375EG	REAL	27-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V	730 U JA	1800 U V	1800 U V	730 U V	730 U V
SS100493	SS00376EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V	740 U V	1800 U V	1800 U V	740 U V	740 U V
SS100493	SS00377EG	REAL	28-SEP-94	350 U V	350 U V	350 U V	350 U V	350 U V	1700 U V	350 U V	710 U JA	1700 U V	1700 U V	710 U V	710 U V
SS100493	SS00378EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	360 U V	360 U V	1700 U V	360 U V	720 U JA	1700 U V	1700 U V	720 U V	720 U V
SS100493	SS00384EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V	730 U V	1800 U V	1800 U V	730 U V	730 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	1800 U V	370 U V	750 U V	1800 U V	1800 U V	750 U V	750 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	360 U V	360 U V	1800 U V	360 U V	730 U V	1800 U V	1800 U V	730 U V	730 U V
SS100493	SS00387EG	REAL	29-SEP-94	360 U V	360 U V	360 U V	360 U V	360 U V	1700 U V	360 U V	720 U V	1700 U V	1700 U V	720 U V	720 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	4-CHLORO-PHENYL PHENYL ETHER	4-METHYL-PHENOL	4-NITRO-ANILINE	4-NITRO-PHENOL	4H-Cyclo-penta (def) phenan-threne	ACENAPH-THENE	ACENAPH-THYLENE	ANTHRA-CENE	BENZO(a) ANTHRACE NE	BENZO(a) PYRENE	BENZO(b) FLUOR-ANTHENE	BENZO(ghi) PERYLENE
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA		1700 U JA	1700 U JA		360 U JA	360 U JA	360 U JA	72 J A	72 J A	170 J A	360 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	350 U V		1700 U V	1700 U V		350 U V	350 U V	350 U V	54 J A	63 J A	77 J A	41 J A
SS100193	SS00369EG	REAL	30-SEP-94	360 U V		1800 U V	1800 U V		360 U V	360 U V	360 U V	78 J A	86 J A	110 J A	56 J A
SS100293	SS00370EG	REAL	29-SEP-94	350 U V		1700 U V	1700 U V		350 U V	350 U V	350 U V	63 J A	61 J A	81 J A	46 J A
SS100293	SS00371EG	REAL	29-SEP-94	350 U V		1700 U V	1700 U V		350 U V	350 U V	350 U V	350 U V	350 U V	50 J A	350 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V		1700 U V	1700 U V		340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V		1700 U V	1700 U V		340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100393	SS00374EG	REAL	30-SEP-94	350 U V		1700 U V	1700 U V		350 U V	350 U V	350 U V	100 J A	110 J A	140 J A	350 U V
SS100493	SS00375EG	REAL	27-SEP-94	370 U V	370 U V	1800 U V	1800 U V	110 J Z	150 J A	370 U V	160 J A	310 J A	370 U R	670 JA	370 U R
SS100493	SS00376EG	REAL	28-SEP-94	370 U V	370 U V	1800 U V	1800 U V		370 U V	370 U V	370 U V	370 U V	370 U JA	370 U JA	370 U JA
SS100493	SS00377EG	REAL	28-SEP-94	350 U V	350 U V	1700 U V	1700 U V		60 J A	350 U V	72 J A	150 J A	350 U R	280 J A	350 U R
SS100493	SS00378EG	REAL	28-SEP-94	360 U V	360 U V	1700 U V	1700 U V		360 U V	360 U V	360 U V	67 J A	360 U R	360 U R	360 U R
SS100493	SS00384EG	REAL	28-SEP-94	370 U V		1800 U V	1800 U V		370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V		1800 U V	1800 U V		370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U V	360 U V	1800 U V	1800 U V		360 U V	360 U V	360 U V	360 U V	100 J A	360 U R	360 U R
SS100493	SS00387EG	REAL	29-SEP-94	360 U V	360 U V	1700 U V	1700 U V		360 U V	360 U V	360 U V	360 U V	77 J A	360 U JA	360 U JA

SEMIVOLATILE ORGANICS (continued)
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	BENZO(k) FLUOR-ANTHENE	BENZOIC ACID	BENZYL ALCOHOL	BIS(2-CHLORO-ETHOXY) METHANE	BIS(2-CHLORO-ETHYL) ETHER	BIS(2-CHLORO-ISOPROPYL) ETHER	BIS(2-ETHYL-HEXYL) PHTHALATE	BUTYL BENZYL PHTHALATE	CHRYSENE	DI-n-BUTYL PHTHALATE	DI-n-OCTYL PHTHALATE	DIBENZ-(a,h)-ANTHRA-CENE
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA	1700 U JA	710 U JA	360 U JA	360 U JA	360 U JA	98 J A	360 U JA	91 J A	360 U JA	64 J A	360 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	35 J A	69 J A	700 U V	350 U V	350 U V	350 U R	360 V	350 U V	65 J A	350 U V	350 U V	350 U V
SS100193	SS00369EG	REAL	30-SEP-94	44 J A	1800 U V	720 U V	360 U V	360 U V	360 U R	360 U V	360 U V	97 J A	360 U V	360 U V	360 U V
SS100293	SS00370EG	REAL	29-SEP-94	350 U V	1700 U V	700 U V	350 U V	350 U V	350 U R	41 J A	350 U V	69 J A	350 U V	350 U V	350 U V
SS100293	SS00371EG	REAL	29-SEP-94	350 U V	1700 U V	700 U V	350 U V	350 U V	350 U R	76 J A	350 U V	44 J A	350 U V	350 U V	350 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V	1700 U V	690 U V	340 U V	340 U V	340 U R	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V	1700 U V	690 U V	340 U V	340 U V	340 U R	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100393	SS00374EG	REAL	30-SEP-94	55 J A	1700 U V	710 U V	350 U V	350 U V	350 U R	350 U V	350 U V	130 J A	350 U V	350 U V	350 U V
SS100493	SS00375EG	REAL	27-SEP-94	370 U R	90 J A	730 U V	370 U V	370 U V	370 U R	7300 E Z	370 U JA	350 J A	370 U V	400 JA	370 U R
SS100493	SS00376EG	REAL	28-SEP-94	370 U JA	210 J A	740 U V	370 U V	370 U V	370 U R	6800 E Z	370 U V	370 U V	370 U V	87 J A	370 U JA
SS100493	SS00377EG	REAL	28-SEP-94	350 U R	290 J A	710 U V	350 U V	350 U V	350 U R	27000 E Z	350 U JA	180 J A	79 J A	690 JA	350 U R
SS100493	SS00378EG	REAL	28-SEP-94	360 U R	250 J A	720 U V	360 U V	360 U V	360 U R	72000 E Z	360 U JA	120 J A	190 J A	2000 JA	360 U R
SS100493	SS00384EG	REAL	28-SEP-94	370 U V	180 J A	730 U V	370 U V	370 U V	370 U R	980 V	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V	170 J A	750 U V	370 U V	370 U V	370 U R	210 J A	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U R	1800 U V	730 U V	360 U V	360 U V	360 U R	8900 E Z	360 U V	52 J A	360 U V	260 J A	360 U R
SS100493	SS00387EG	REAL	29-SEP-94	360 U JA	42 J A	720 U V	360 U V	360 U V	360 U R	3400 E Z	360 U V	47 J A	49 J A	110 J A	360 U JA

LOCATION	SAMPLE	TYPE	SAMPLE DATE	DIBENZO-FURAN	DIETHYL PHTHALATE	DIMETHYL PHTHALATE	FLUOR-ANTHENE	FLUORENE	HEXA-CHLORO-BENZENE	HEXA-CHLORO-BUTA-DIENE	HEXA-CHLORO-CYCLO-PENTA-DIENE	HEXA-CHLORO-ETHANE	INDENO (1,2,3-cd) PYRENE	ISO-PHORONE	N-NITROSO-DI-n-PRO-PYLAMINE
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA	360 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	160 J A	350 U V	350 U V	350 U V	350 U V	350 U V	41 J A	350 U V	350 U V
SS100193	SS00369EG	REAL	30-SEP-94	360 U V	360 U V	360 U V	240 J A	360 U V	360 U V	360 U V	360 U V	360 U V	61 J A	360 U V	360 U V
SS100293	SS00370EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	190 J A	350 U V	350 U V	350 U V	350 U V	350 U V	52 J A	350 U V	350 U V
SS100293	SS00371EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	96 J A	350 U V	350 U V	350 U V	350 U V	350 U V	350 U V	350 U V	350 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V	340 U V
SS100393	SS00374EG	REAL	30-SEP-94	350 U V	350 U V	350 U V	280 J A	350 U V	350 U V	350 U V	350 U V	350 U V	84 J A	350 U V	350 U V
SS100493	SS00375EG	REAL	27-SEP-94	52 J A	370 U V	370 U V	690 V	120 J A	370 U V	370 U V	370 U V	370 U V	370 U R	370 U V	370 U V
SS100493	SS00376EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	59 J A	370 U V	370 U V	370 U V	370 U V	370 U V	370 U JA	370 U V	370 U V
SS100493	SS00377EG	REAL	28-SEP-94	350 U V	350 U V	350 U V	360 V	44 J A	350 U V	350 U V	350 U V	350 U V	350 U R	350 U V	350 U V
SS100493	SS00378EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	150 J A	360 U V	360 U V	360 U V	360 U V	360 U V	360 U R	360 U V	360 U V
SS100493	SS00384EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V	370 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	63 J A	360 U V	360 U V	360 U V	360 U V	360 U V	360 U R	360 U V	360 U V
SS100493	SS00387EG	REAL	29-SEP-94	360 U V	360 U V	360 U V	360 U V	360 U V	360 U V	360 U V	360 U V	360 U V	360 U JA	360 U V	360 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	N-NITROSO-DIPHENYL-AMINE	NAPHTH-ALENE	NITRO-BENZENE	PENTA-CHLORO-PHENOL	PHEN-ANTHRENE	PHENOL	PYRENE	Phenol, 2,6-bis(1,1-di-methylethyl)	Phosphoric acid, trihexyl ester	m + p CRESOL	p-BROMO-DIPHENYL ETHER
881-16/17	SS00379EG	REAL	29-SEP-94	360 U JA	360 U JA	360 U JA	1700 U JA	160 J A	360 U JA	230 J A		11000 J Z	360 U JA	360 U JA
881-18/19	SS00380EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	1700 U V	98 J A	350 U V	130 J A			350 U V	350 U V
SS100193	SS00369EG	REAL	30-SEP-94	360 U V	360 U V	360 U V	1800 U V	170 J A	360 U V	190 J A			360 U V	360 U V
SS100293	SS00370EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	1700 U V	160 J A	350 U V	140 J A			350 U V	350 U V
SS100293	SS00371EG	REAL	29-SEP-94	350 U V	350 U V	350 U V	1700 U V	63 J A	350 U V	78 J A			350 U V	350 U V
SS100293	SS00381EG	DUP	29-SEP-94	340 U V	340 U V	340 U V	1700 U V	340 U V	340 U V	340 U V			340 U V	340 U V
SS100293	SS00372EG	REAL	30-SEP-94	340 U V	340 U V	340 U V	1700 U V	340 U V	340 U V	340 U V			340 U V	340 U V
SS100393	SS00374EG	REAL	30-SEP-94	350 U V	350 U V	350 U V	1700 U V	190 J A	350 U V	230 J V			350 U V	350 U V
SS100493	SS00375EG	REAL	27-SEP-94	370 U V	56 J A	370 U V	1800 U V	740 V	370 U V	1700 JA				370 U V
SS100493	SS00376EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	1800 U V	43 J A	370 U V	64 J A				370 U V
SS100493	SS00377EG	REAL	28-SEP-94	350 U V	350 U V	350 U V	1700 U V	310 J A	350 U V	570 JA				350 U V
SS100493	SS00378EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	1700 U V	140 J A	360 U V	340 J A				360 U V
SS100493	SS00384EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	1800 U V	370 U V	370 U V	370 U V			370 U V	370 U V
SS100493	SS00385EG	REAL	28-SEP-94	370 U V	370 U V	370 U V	1800 U V	370 U V	370 U V	370 U V			370 U V	370 U V
SS100493	SS00386EG	REAL	28-SEP-94	360 U V	360 U V	360 U V	1800 U V	41 J A	360 U V	90 J A	240 J Z			360 U V
SS100493	SS00387EG	REAL	29-SEP-94	360 U V	360 U V	360 U V	1700 U V	360 U V	360 U V	360 U V				360 U V

TCLP HERBICIDES
(ug/l)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	PROPANOIC ACID, 2-(2,4,5-TP) (SILVEX)	2,4-DICHLORO-PHENOXY-ACETIC ACID
881-16/17	SS00379EG	REAL	29-SEP-94	17 U V	120 U V
881-18/19	SS00380EG	REAL	29-SEP-94	17 U V	120 U V
SS100193	SS00369EG	REAL	30-SEP-94	17 U V	120 U V
SS100293	SS00370EG	REAL	29-SEP-94	17 U V	120 U V
SS100293	SS00371EG	REAL	29-SEP-94	17 U V	120 U V
SS100293	SS00381EG	DUP	29-SEP-94	17 U V	120 U V
SS100293	SS00372EG	REAL	30-SEP-94	17 U V	120 U V
SS100393	SS00374EG	REAL	30-SEP-94	17 U V	120 U V
SS100493	SS00375EG	REAL	27-SEP-94	17 U JA	120 U JA
SS100493	SS00376EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00377EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00378EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00384EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00385EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00386EG	REAL	28-SEP-94	17 U JA	120 U JA
SS100493	SS00387EG	REAL	29-SEP-94	17 U V	120 U V

HERBICIDES
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	PROPANOIC ACID, 2-(2,4,5-TP) (SILVEX)	2,4,5-TRICHLORO-PHENOXYACETIC ACID	2,4-DICHLORO
881-16/17	SS00379EG	REAL	29-SEP-94	37 U V	43 U V	260 U V
881-18/19	SS00380EG	REAL	29-SEP-94	37 U V	44 U V	260 U V
SS100193	SS00369EG	REAL	30-SEP-94	37 U V	44 U V	260 U V
SS100293	SS00370EG	REAL	29-SEP-94	36 U V	42 U V	260 U V
SS100293	SS00371EG	REAL	29-SEP-94	36 U V	43 U V	260 U V
SS100293	SS00381EG	DUP	29-SEP-94	36 U V	42 U V	250 U V
SS100293	SS00372EG	REAL	30-SEP-94	36 U V	42 U V	250 U V
SS100393	SS00374EG	REAL	30-SEP-94	36 U V	43 U V	260 U V
SS100493	SS00375EG	REAL	27-SEP-94	38 U V	44 U V	270 U V
SS100493	SS00376EG	REAL	28-SEP-94	38 U V	45 U V	270 U V
SS100493	SS00377EG	REAL	28-SEP-94	37 U V	43 U V	260 U V
SS100493	SS00378EG	REAL	28-SEP-94	37 U V	43 U V	260 U V
SS100493	SS00384EG	REAL	28-SEP-94	37 U V	44 U V	260 U V
SS100493	SS00385EG	REAL	28-SEP-94	39 U V	45 U V	270 U V
SS100493	SS00386EG	REAL	28-SEP-94	37 U V	44 U V	260 U V
SS100493	SS00387EG	REAL	29-SEP-94	37 U V	44 U V	260 U V

TCLP PESTICIDE/PCB'S
(ug/l)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	HEPTACHLOR EPOXIDE	CHLORDANE	gamma-BHC (LINDANE)	ENDRIN	METHOXYCHLOR	HEPTACHLOR	TOXAPHENE
881-16/17	SS00379EG	REAL	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
881-18/19	SS00380EG	REAL	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100193	SS00369EG	REAL	30-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100293	SS00370EG	REAL	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100293	SS00371EG	REAL	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100293	SS00381EG	DUP	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100293	SS00372EG	REAL	30-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100393	SS00374EG	REAL	30-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00375EG	REAL	27-SEP-94	4.2 U V	0.70 U Y	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00376EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00377EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00378EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00384EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00385EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00386EG	REAL	28-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V
SS100493	SS00387EG	REAL	29-SEP-94	4.2 U V	0.70 U V	0.20 U V	0.30 U V	8.8 U V	0.15 U V	12 U V

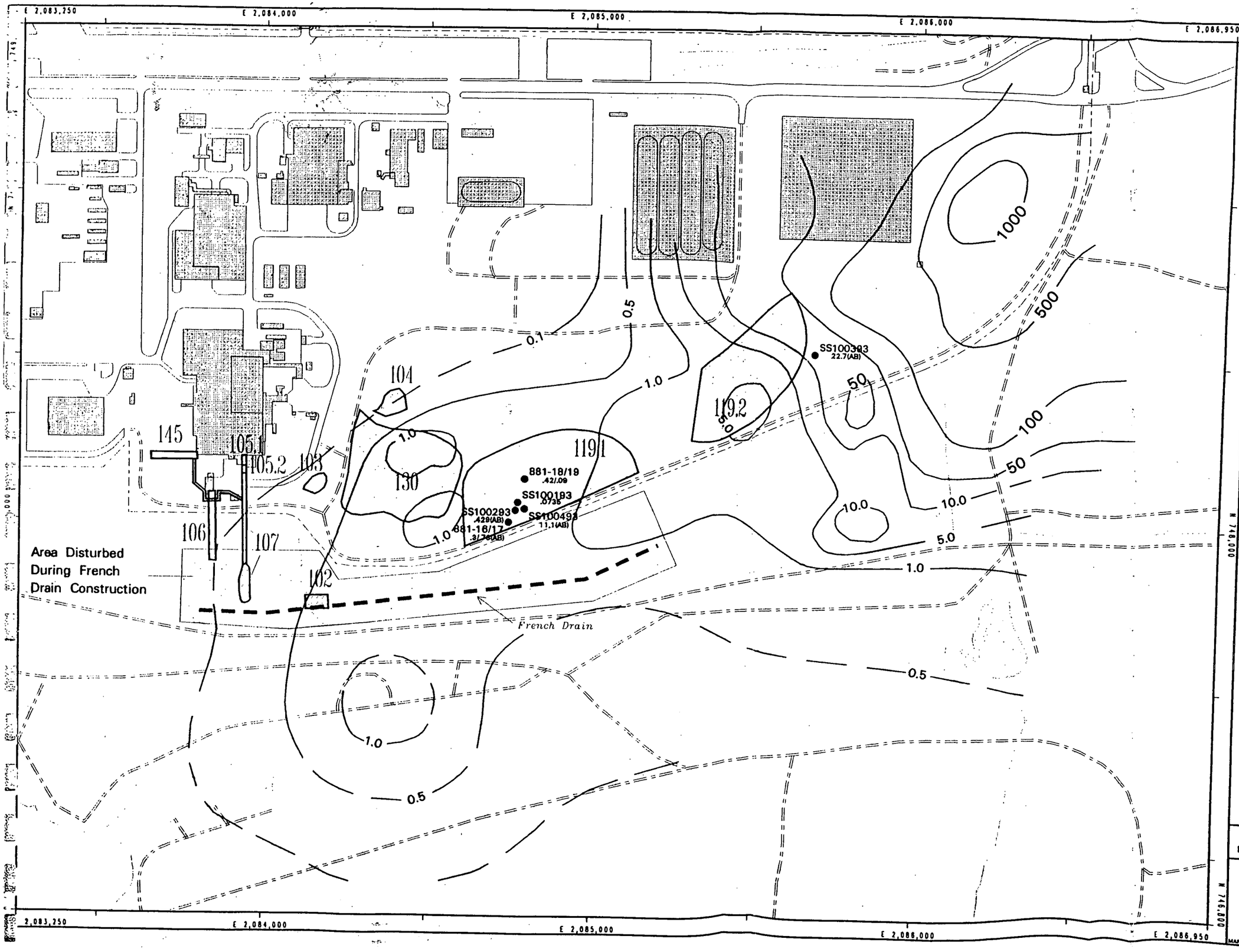
PESTICIDE/PCB'S
(ug/kg)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	AROCLOR-1016	AROCLOR-1221	AROCLOR-1232	AROCLOR-1242	AROCLOR-1248	AROCLOR-1254	AROCLOR-1260	CHLORDANE	DIELDRIN
881-16/17	SS00379EG	REAL	29-SEP-94	3.8 U V	6.6 UX V	26 UX V	4.3 UX V	35 U V	35 U V	35 U V	35 U V	35 U V	110 JA	35 U V	4.9 U V	11 UX V
881-18/19	SS00380EG	REAL	29-SEP-94	4.0 U V	1.4 U V	22 UX V	1.4 U V	36 U V	36 U V	36 U V	36 U V	36 U V	48 JA	36 U V	5.1 U V	4.2 UX V
SS100193	SS00369EG	REAL	30-SEP-94	3.9 U V	12 UX V	66 UX V	11 UX V	35 U V	35 U V	35 U V	35 U V	35 U V	250 JA	35 U V	5.0 U V	24 UX V
SS100293	SS00370EG	REAL	29-SEP-94	3.9 U V	1.4 U V	13 UX V	1.4 U V	35 U V	35 U V	35 U V	35 U V	35 U V	80 JA	35 U V	4.9 U V	4.5 UX V
SS100293	SS00371EG	REAL	29-SEP-94	3.8 U V	2.5 UX V	24 UX V	1.4 U V	35 U V	35 U V	35 U V	35 U V	35 U V	140 JA	35 U V	4.9 U V	4.2 UX V
SS100293	SS00381EG	DUP	29-SEP-94	3.9 U V	2.4 UX V	9.8 UX V	1.4 U V	35 U V	35 U V	35 U V	35 U V	35 U V	55 JA	35 U V	4.9 U V	4.4 UX V
SS100293	SS00372EG	REAL	30-SEP-94	3.8 U V	1.4 U V	4.2 U V	1.4 U V	35 U V	35 U V	35 U V	35 U V	35 U V	35 U V	35 U V	4.9 U V	0.92 UX V
SS100393	SS00374EG	REAL	30-SEP-94	4.4 UX V	6.9 UX V	34 UX V	4.5 UX V	35 U V	35 U V	35 U V	35 U V	35 U V	97 JA	35 U V	4.9 U V	14 UX V
SS100493	SS00375EG	REAL	27-SEP-94	4.1 U V	6.3 UX V	87 UX V	1.5 U V	37 U V	37 U V	37 U V	37 U V	37 U V	290 JA	37 U V	5.2 U V	1.7 UX V
SS100493	SS00376EG	REAL	28-SEP-94	4.0 U V	1.4 U V	56 UX V	1.4 U V	36 U V	36 U V	36 U V	36 U V	36 U V	180 JA	36 U V	5.0 U V	1.1 UX V
SS100493	SS00377EG	REAL	28-SEP-94	3.9 U V	4.6 UX V	77 UX V	1.4 U V	36 U V	36 U V	36 U V	36 U V	36 U V	200 JA	36 U V	5.0 U V	13 UX V
SS100493	SS00378EG	REAL	28-SEP-94	4.0 U V	1.4 U V	50 JA	1.4 U V	36 U V	36 U V	36 U V	36 U V	36 U V	36 U V	36 U V	5.0 U V	4.3 V
SS100493	SS00384EG	REAL	28-SEP-94	4.0 U JA	1.5 U JA	4.4 U JA	1.5 U JA	37 U JA	37 U JA	37 U JA	37 U JA	37 U JA	46 U JA	37 U JA	5.1 U JA	0.73 U JA
SS100493	SS00385EG	REAL	28-SEP-94	4.1 U JA	1.5 U JA	4.5 U JA	1.5 U JA	37 U JA	37 U JA	37 U JA	37 U JA	37 U JA	52 U JA	37 U JA	5.2 U JA	0.75 U JA
SS100493	SS00386EG	REAL	28-SEP-94	4.0 U JA	2.2 UX JA	27 UX JA	1.4 U JA	36 U JA	36 U JA	36 U JA	36 U JA	36 U JA	76 JA	36 U JA	5.0 U JA	1.0 UX JA
SS100493	SS00387EG	REAL	29-SEP-94	4.0 U V	1.5 U V	11 UX V	1.5 U V	36 U V	36 U V	36 U V	36 U V	36 U V	52 JA	36 U V	5.1 U V	0.73 U V

LOCATION	SAMPLE	TYPE	SAMPLE DATE	ENDOSULFAN I	ENDOSULFAN II	ENDOSULFAN SULFATE	ENDRIN	ENDRIN ALDEHYDE	HEPTACHLOR	HEPTACHLOR EPOXIDE	METHOXYCHLOR	TOXAPHENE	alpha-BHC	beta-BHC	delta-BHC	gamma-BHC (LINDANE)
881-16/17	SS00379EG	REAL	29-SEP-94	4.9 U V	1.4 U V	23 U V	7.8 UX V	8.0 U V	1.0 U V	29 U V	62 U V	84 U V	1.0 U V	2.1 U V	3.2 U V	1.4 U V
881-18/19	SS00380EG	REAL	29-SEP-94	5.1 U V	1.4 U V	24 U V	7.0 UX V	8.4 U V	1.1 U V	30 U V	64 U V	87 U V	1.1 U V	2.2 U V	3.3 U V	3.2 JA
SS100193	SS00369EG	REAL	30-SEP-94	5.0 U V	1.4 U V	23 U V	16 UX V	8.2 U V	1.1 U V	29 U V	62 U V	85 U V	1.1 U V	2.1 U V	3.2 U V	1.7 JA
SS100293	SS00370EG	REAL	29-SEP-94	4.9 U V	8.2 UX V	23 U V	4.6 UX V	8.1 U V	1.0 U V	29 U V	62 U V	84 U V	1.0 U V	2.1 U V	3.2 U V	1.4 U V
SS100293	SS00371EG	REAL	29-SEP-94	4.9 U V	1.4 U V	23 U V	2.1 U V	8.0 U V	1.0 U V	29 U V	62 U V	84 U V	1.0 U V	2.1 U V	3.2 U V	1.4 U V
SS100293	SS00381EG	DUP	29-SEP-94	4.9 U V	1.4 U V	23 U V	3.0 UX V	8.1 U V	1.0 U V	29 U V	62 U V	84 U V	1.0 U V	2.1 U V	3.2 U V	1.4 U V
SS100293	SS00372EG	REAL	30-SEP-94	4.9 U V	1.4 U V	23 U V	2.1 U V	8.1 U V	1.0 U V	29 U V	62 U V	84 U V	1.0 U V	2.1 U V	3.2 U V	1.4 U V
SS100393	SS00374EG	REAL	30-SEP-94	4.9 U V	1.8 UX V	23 U V	9.6 UX V	8.1 U V	1.1 U V	29 U V	62 U V	84 U V	1.1 U V	2.1 U V	3.2 U V	1.4 U V
SS100493	SS00375EG	REAL	27-SEP-94	5.2 U V	3.3 UX V	24 U V	28 UX V	8.5 U V	1.1 U V	31 U V	65 U V	89 U V	1.1 U V	2.2 U V	3.3 U V	2.8 JA
SS100493	SS00376EG	REAL	28-SEP-94	5.0 U V	12 UX V	24 U V	30 UX V	72 M V	1.1 U V	30 U V	63 U V	86 U V	1.1 U V	2.2 U V	3.2 U V	9.4 JA
SS100493	SS00377EG	REAL	28-SEP-94	5.0 U V	1.4 U V	24 U V	25 UX V	8.2 U V	1.1 U V	30 U V	63 U V	86 U V	1.1 U V	2.1 U V	3.2 U V	5.0 JA
SS100493	SS00378EG	REAL	28-SEP-94	6.6 V	18 V	24 U V	2.2 U V	8.2 U V	3.6 JA	30 U V	63 U V	86 U V	1.1 U V	2.2 U V	3.2 U V	1.4 U V
SS100493	SS00384EG	REAL	28-SEP-94	5.1 U JA	1.5 U JA	24 U JA	2.2 U JA	8.4 U JA	1.1 U JA	30 U JA	65 U JA	88 U JA	1.1 U JA	2.2 U JA	3.2 U JA	1.5 U JA
SS100493	SS00385EG	REAL	28-SEP-94	5.2 U JA	1.5 U JA	25 U JA	2.2 U JA	8.6 U JA	1.1 U JA	31 U JA	66 U JA	90 U JA	1.1 U JA	2.2 U JA	3.4 U JA	1.5 U JA
SS100493	SS00386EG	REAL	28-SEP-94	5.0 U JA	2.1 UX JA	24 U JA	8.1 UX JA	8.3 U JA	1.1 U JA	30 U JA	63 U JA	86 U JA	1.1 U JA	2.2 U JA	3.2 U JA	3.7 JA
SS100493	SS00387EG	REAL	29-SEP-94	5.1 U V	1.7 UX V	24 U V	2.2 U V	8.4 U V	1.1 U V	30 U V	64 U V	88 U V	1.1 U V	2.2 U V	3.3 U V	4.6 JA

WATER QUALITY PARAMETERS
(ug/g)

LOCATION	SAMPLE	TYPE	SAMPLE DATE	pH	SULFIDE	CYANIDE	TOX
881-16/17	SS00379EG	REAL	29-SEP-94	7.83 JA	12.3 U V	0.53 U V	92.2 V
881-18/19	SS00380EG	REAL	29-SEP-94	8.40 JA	16.8 V	0.54 U V	105 V
SS100193	SS00369EG	REAL	30-SEP-94	8.89 JA	12.0 U V	0.54 U V	52.3 U V
SS100293	SS00370EG	REAL	29-SEP-94	9.66 JA	12.3 U V	0.53 U V	50.8 U V
SS100293	SS00371EG	REAL	29-SEP-94	8.20 JA	12.1 U V	0.53 U V	51.8 U V
SS100293	SS00381EG	DUP	29-SEP-94	9.67 JA	12.1 U V	0.52 U V	51.2 U V
SS100293	SS00372EG	REAL	30-SEP-94	8.86 JA	11.5 U V	0.52 U V	50.6 U V
SS100393	SS00374EG	REAL	30-SEP-94	7.74 JA	12.1 U V	0.53 U V	51.1 U V
SS100493	SS00375EG	REAL	27-SEP-94	8.56 JA	12.0 V	0.55 U V	57.7 V
SS100493	SS00376EG	REAL	28-SEP-94	8.21 JA	12.2 U V	0.56 U V	53.6 U V
SS100493	SS00377EG	REAL	28-SEP-94	8.94 JA	14.5 V	0.53 U V	51.8 U V
SS100493	SS00378EG	REAL	28-SEP-94	8.31 JA	12.3 U V	0.54 U V	72.9 V
SS100493	SS00384EG	REAL	28-SEP-94	8.51 JA	12.0 U V	0.55 U V	53.4 U V
SS100493	SS00385EG	REAL	28-SEP-94	8.68 JA	12.2 U V	0.57 U V	54.0 U V
SS100493	SS00386EG	REAL	28-SEP-94	7.99 JA	12.0 U V	0.54 U V	180 V
SS100493	SS00387EG	REAL	29-SEP-94	8.14 JA	12.4 U V	0.54 U V	142 V



Operable Unit No. 1
Accelerated Response Action
Completion Report

Activity Isopleths For Plutonium 239/240 In Surface Soils

Figure 2-2

EXPLANATION

- "Hot Spot" Surface Soil Sampling Location
  AB = above background
- OU 1 IHSS
- Concentration Isopleth Lines (Pu 239/240 - pCi/g)

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Security Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - date unknown
Individual Hazardous Substance Sites (IHSS's) are determined by the following:
OU1 - RFI/RI Phase III Report
OUS, 4, 7, 11, & 18 - 1991
The remaining OU's are defined by their respective Operable Unit Workplan.

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Scale = 1 : 3750
1 inch represents approximately 270.83 feet
0 — 600

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: Dres8

April 15, 1992

/home/ds812660/projects/ou1/pu230.eml

E 2,083,250 E 2,084,000 E 2,085,000 E 2,086,000 E 2,086,950

N 749,500 N 749,000 N 748,500 N 748,000 N 747,800

104 145 105.1 105.2 103 130 119.2 119.1 106 107 102

SS100393 1.49

881-18/19 60(AB)/10(AB)

SS100193 428(AB)

SS100293 240(AB)

SS100493 9.68(AB)

881-16/17 50(AB)/18(AB)

Area Disturbed During French Drain Construction

French Drain

Operable Unit No. 1
Accelerated Response Action
Completion Report

Uranium 233/234 in OU1 Surface Soils

Figure 2-4

Surface Soil Sampling Locations

(pCi/g)

- 0 - 1.6
- 1.6 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- > 50

AB = Above Background Limits

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Security Fences
- Paved roads
- Dirt roads

DATA SOURCE

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Hydrology provided by USGS - Aerial coverage
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OU2, 4, 7, 11, & 16 - TBD
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Scale = 1 : 3,200
1 inch represents approximately 270.83 feet
0 500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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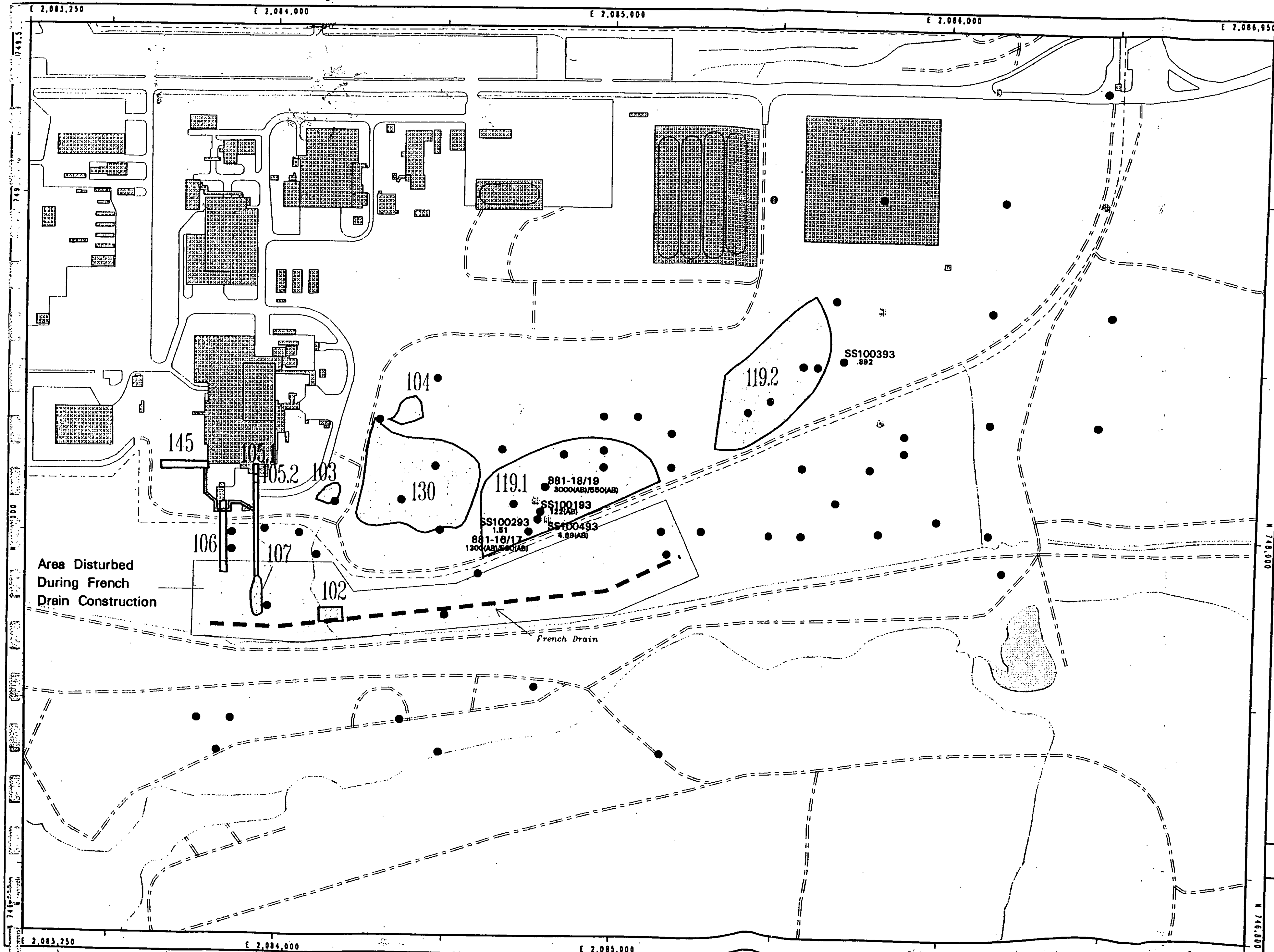
Golden, Colorado 80402-0464

MAP ID: DrnR

mxd\81200\projects\ou1\u234.eml



Operable Unit No. 1
Accelerated Response Action
Completion Report

Uranium 238 in OU1 Surface Soils

Figure 2-5

Surface Soil Sampling Locations

(pCi/g)

- 0 - 2.0
- 2.0 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- > 50

AB = Above Background Limits

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Security Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by
Facilities Engr.,
EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by
USGS - (date unknown)
Individual Hazardous Substance Sites (IHSS's)
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OU2, 4, 7, 11, & 15 - HRR
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Scale = 1 : 3250
1 inch represents approximately 270.83 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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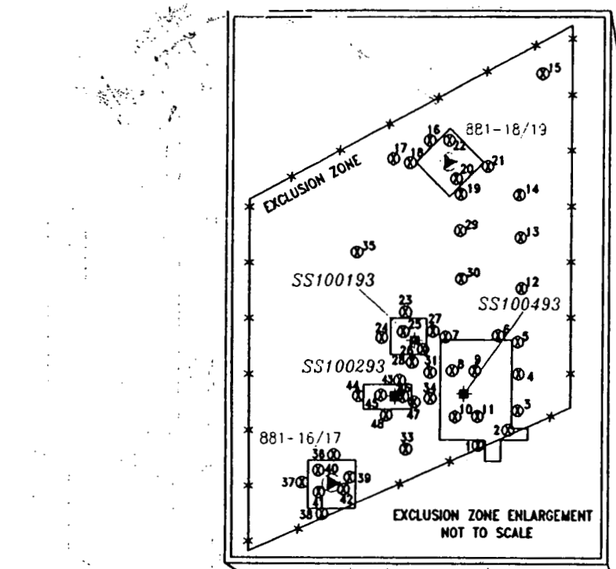
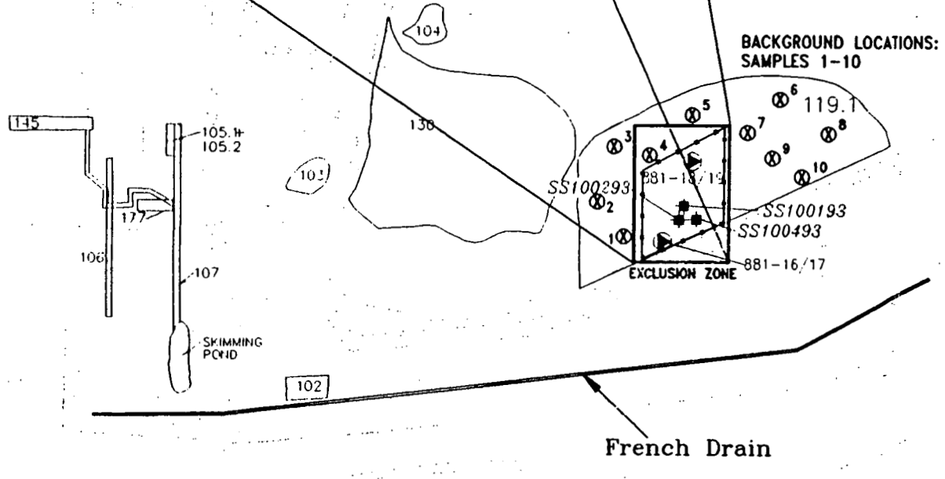
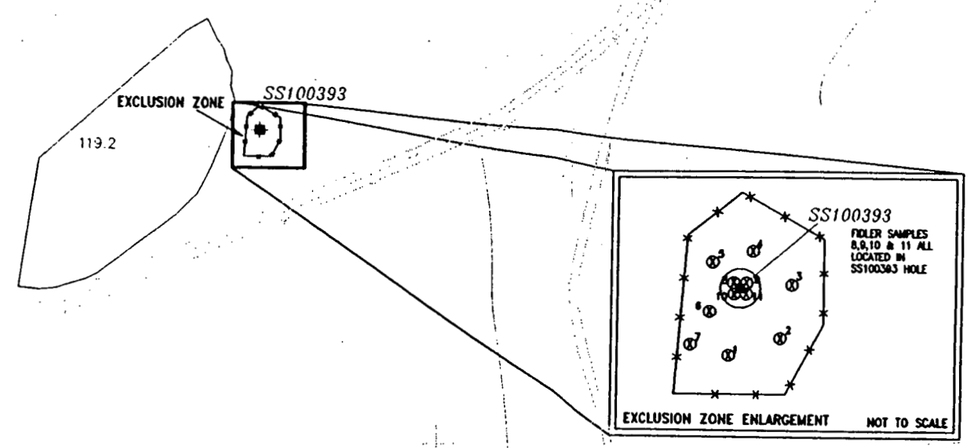
MAP ID: Draft

April 17, 1995







EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

SS100193 — "HOT SPOT" SAMPLING LOCATION (pCi/g)

881-1 — 1987 APPROXIMATE SURFACE SCRAPE LOCATION

6 — APPROXIMATE FIDLER MEASUREMENT LOCATION

N

0 125 250

SCALE: 1" = 250'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Environmental Technology Site
Golden, Colorado

OPERABLE UNIT NO. 1
ACCELERATED RESPONSE ACTION
COMPLETION REPORT

Local Background & FIDLER Measurement Locations

Figure 3-1

E 2,083,250 E 2,084,000 E 2,085,000 E 2,086,000 E 2,086,950

N 749,500 N 749,000 N 748,000 N 747,000 N 746,000

5.0 10.0 50.0 100.00 10.0 5.0 1.0 0.5 0.1 0.05 0.1 0.05 0.05 0.05

104 145 105.1 105.2 103 130 119.2 119.1 106 107 102

0.05

SS100393 .418(AB)

881-18/19

SS100183 .284(AB)

SS100293 .153(AB)

SS100493 2650

881-16/17

Area Disturbed During French Drain Construction

French Drain

Operable Unit No. 1
Accelerated Response Action
Completion Report

Activity Isopleths For Americium 241 In Surface Soils

Figure 2-3

EXPLANATION

- "Hot Spot" Surface Soil Sampling Location AB = above background
- OU 1 IHSS
- Concentration Isopleth Lines (Am 241 - pCi/g)

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Security Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Dept., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - Edaco entrenvro
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OU1 - RFI/RI Phase III Report
OU2, 4, 7, 11, & 18 - NFA
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Scale = 1 : 3250
1 inch represents approximately 270.83 feet
0 300

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: DrwR
April 19, 1999